
11 14 75
1 2000
45 2 55
KODAK SAFETY FILM


5 11 89
1 2000
45 2 № 57

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We make Indiana a cleaner, healthier place to live

Frank O'Bannon
Governor

Lori F. Kaplan
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
(317) 232-8603
(800) 451-6027
www.state.in.us/idem

May 4, 2000

Mr. Jonathan Adenuga
Corrective Action Section
U.S. EPA
77 W Jackson Blvd.
Chicago, IL 60604

Re: Transmittal of Photographs
LTV's Aerial Photographs
IND 005 462 601

Dear Mr. Adenuga:

This letter transmits two aerial photographs of LTV Steel. These pictures were taken on May 5, 1989 and November 11, 1975. The May photo appears to show SWMU 27 and the November photo shows the Coke Plant.

If you have any questions please contact me at 317/233-4625.

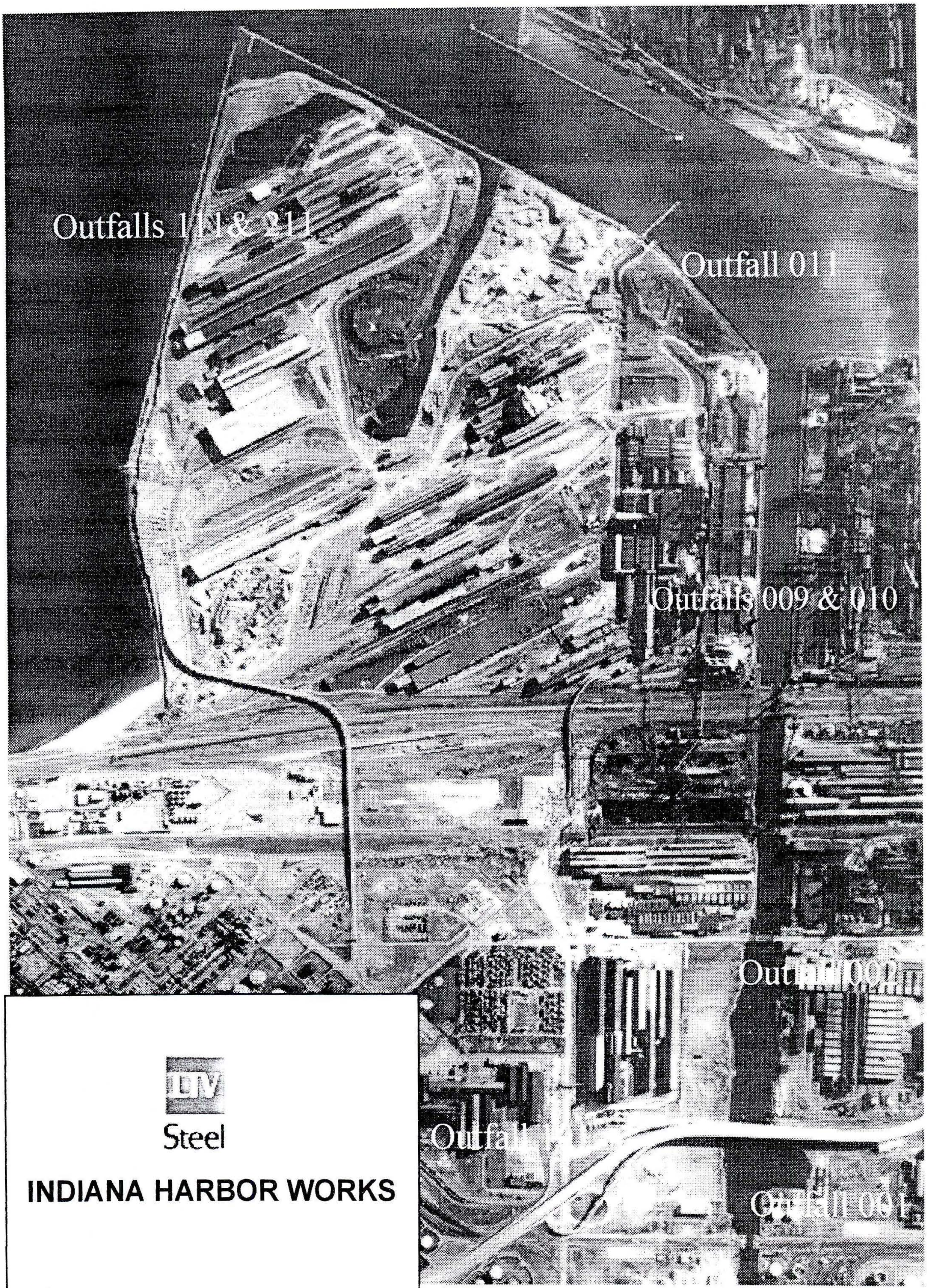
Sincerely,

Chris L. Myer

Chris L Myer, Project Manager
State Cleanup, Removals and RCRA
Corrective Action Section
Remediation Branch
Office of Land Quality

CM/sd

Enclosures



HARB.PPT

JWF - 1997

Photo 15 - View from ditch located on the eastern edge of the facility looking south towards the tank farm.

Photo 16 - Liquid in the trench which runs through the production portion of the facility. Note sheen on the water surface.

Photo 17 - Benzene measure tank #64. Note deteriorated base concrete and exposed soil.

Photo 1 - "Plastic" pond looking north. Note evidence of overflow on the north side of the pond.

Photo 2 -"Plastic" pond looking east. Note evidence of overflow on the north side of the pond.

Photo 3 - “Plastic” pond overflow area looking south towards the pond.

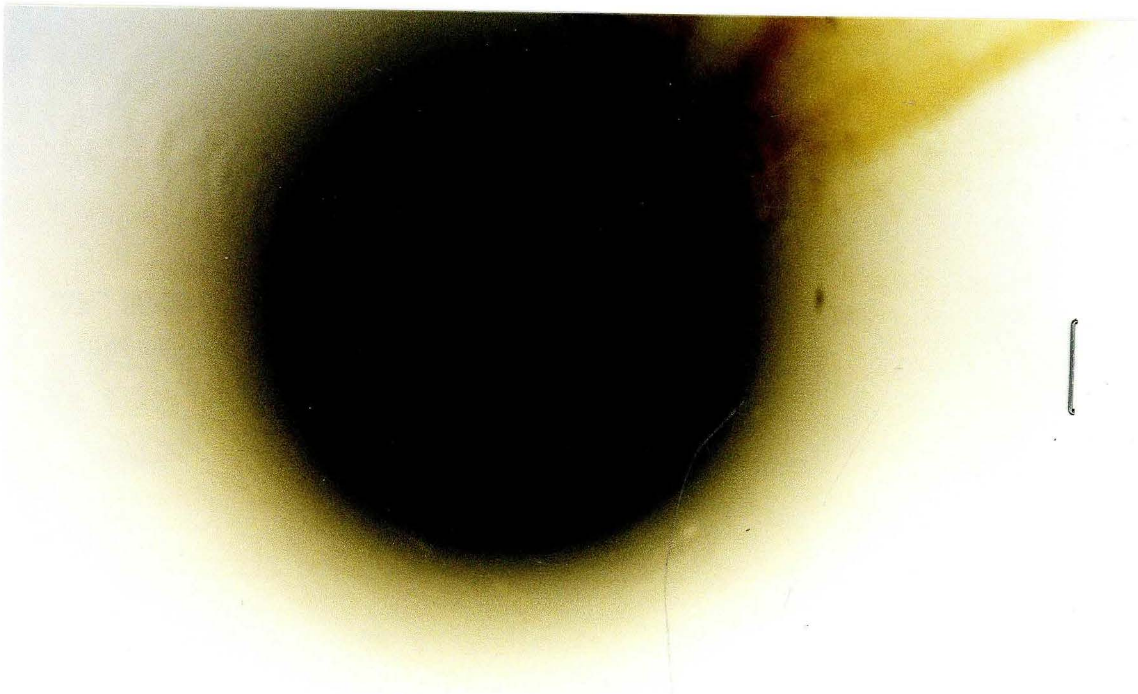


Photo 4 - View looking down valve pipe stack found in the area between the “plastic” and “natural” pond.

Photos 5 & 6 - Valve pipe stacks found in the area between the "plastic" and "natural" pond.

Photo 7 - Natural pond looking northwest.

Photo 8 - Monitoring well located near the natural pond. Note cracked concrete cap.

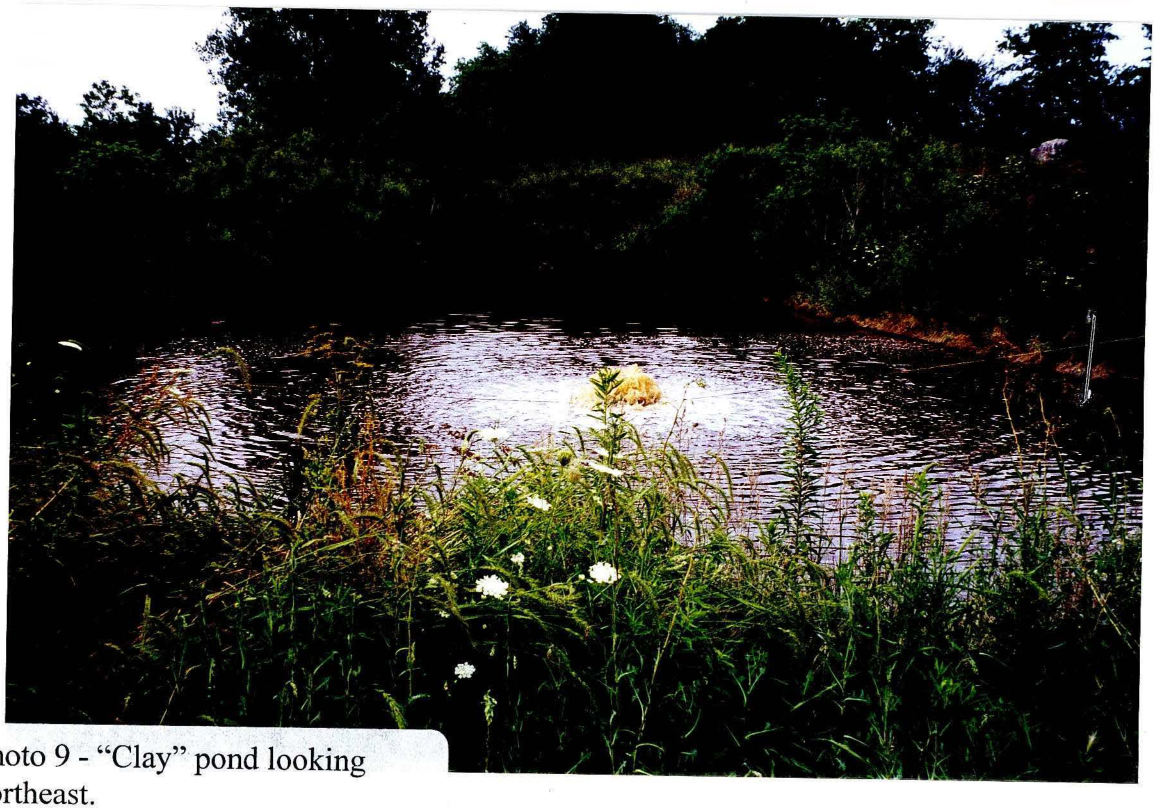


Photo 9 - "Clay" pond looking northeast.

Photo 10 - Salt water waste tanks. Tanks are used to store and neutralize the waste before off-site disposal.

Photos 11 & 12 - Salt water waste tanks.

Photo 13 - Salt water waste tanks. Note tanks are stored open.

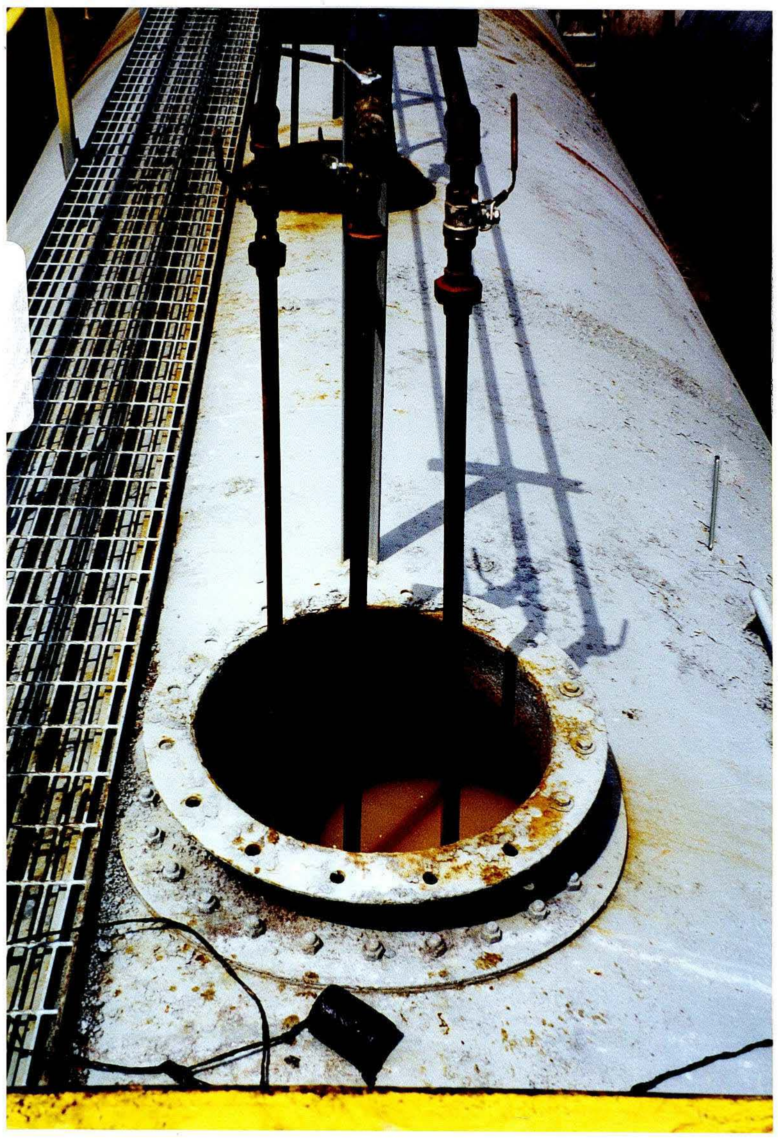
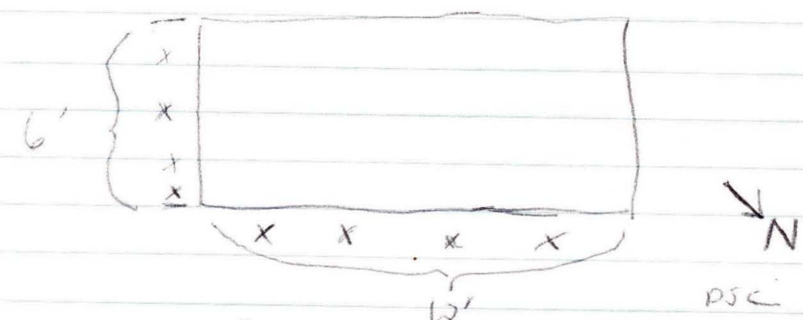


Photo 14 - Ditch located on the eastern edge of the facility and the site of a xylene spills during the 1980s.

11:22 - sample 2000RC S16

SWMU 45 waste sodium dichromate



PSC

Composite for 2000RC S16 at ~~3 2' grid locations~~ 4 locations approx 1.5' apart for composite sample collecting soil approx. 3-5" down at @ location before refusal occurs. Samples analyzed here for totals/TCLP metals and cyanide

The truck loading station itself is concrete - no visible staining is noted around this area.

Samples are collected using Stainless Steel spoon and composited in plastic bowl.

2000RC D16 1122-time

this sample was collected along with 2000RC S16 all samples split with the Contractor for LTV

2000RC ~~D~~ PSC S17 1148

Four areas collected along NE wall approx 3' apart to composite. Samples collected w/ stainless steel spoon + plastic bowl.

All equip. pre-cleaned will be deconned after SWMU 45 completed.

JOB BOOK

FROM PENINSULAR PUBLISHING

PROJECT NAME LTV

PROJECT NUMBER R05 705

CREW Todd Quillen Demaree Collier
Terry Uecker

DATE 7/12/00 BOOK # ____ OF ____

WEATHER Sunny, Light wind, 76°

FIELD BOOK
16 PAGE
8 LEAVES
50% RAG

CURVE FORMULAS

$T = R \tan \frac{1}{2} I$	$R = T \cot. \frac{1}{2} I$	$\text{Chord def.} = \frac{\text{chord}^2}{R}$
$T = \frac{50 \tan \frac{1}{2} I}{\text{Sin.} \frac{1}{2} D}$	$R = \frac{50}{\text{Sin.} \frac{1}{2} D}$	$\text{No. chords} = \frac{I}{D}$
$\text{Sin.} \frac{1}{2} D = \frac{50}{R}$	$E = R \text{ ex. sec } \frac{1}{2} I$	$\text{Tan. def.} = \frac{1}{2} \text{ chord def.}$
$\text{Sin.} \frac{1}{2} D = \frac{50 \tan \frac{1}{2} I}{T}$	$E = T \tan \frac{1}{4} I$	

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.) and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

RIGHT ANGLE TRIANGLES. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. 10. $10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. 25. $25^2 \div 200 = 3.125$; $100 - 3.125 = 96.875$ = Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

LEVELING. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574 d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3} d^2$. The combined correction is negative.

PROBABLE ERROR. If d_1, d_2, d_3, etc. are the discrepancies of various results from the mean, and if Σd^2 = the sum of the squares of these differences and n=the number of observations, then the probable error of the mean=

$$\pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$$

MINUTES IN DECIMALS OF A DEGREE

1′	.0167	**11′**	.1833	**21′**	.3500	**31′**	.5167	**41′**	.6833	**51′**	.8500
2	.0333	**12**	.2000	**22**	.3667	**32**	.5333	**42**	.7000	**52**	.8667
3	.0500	**13**	.2167	**23**	.3833	**33**	.5500	**43**	.7167	**53**	.8833
4	.0667	**14**	.2333	**24**	.4000	**34**	.5667	**44**	.7333	**54**	.9000
5	.0833	**15**	.2500	**25**	.4167	**35**	.5833	**45**	.7500	**55**	.9167
6	.1000	**16**	.2667	**26**	.4333	**36**	.6000	**46**	.7667	**56**	.9333
7	.1167	**17**	.2833	**27**	.4500	**37**	.6167	**47**	.7833	**57**	.9500
8	.1333	**18**	.3000	**28**	.4667	**38**	.6333	**48**	.8000	**58**	.9667
9	.1500	**19**	.3167	**29**	.4833	**39**	.6500	**49**	.8167	**59**	.9833
10	.1667	**20**	.3333	**30**	.5000	**40**	.6667	**50**	.8333	**60**	1.0000

INCHES IN DECIMALS OF A FOOT

1-16	3-32	⅛	3-16	¼	5-16	⅜	½	⅝	¾	⅞
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

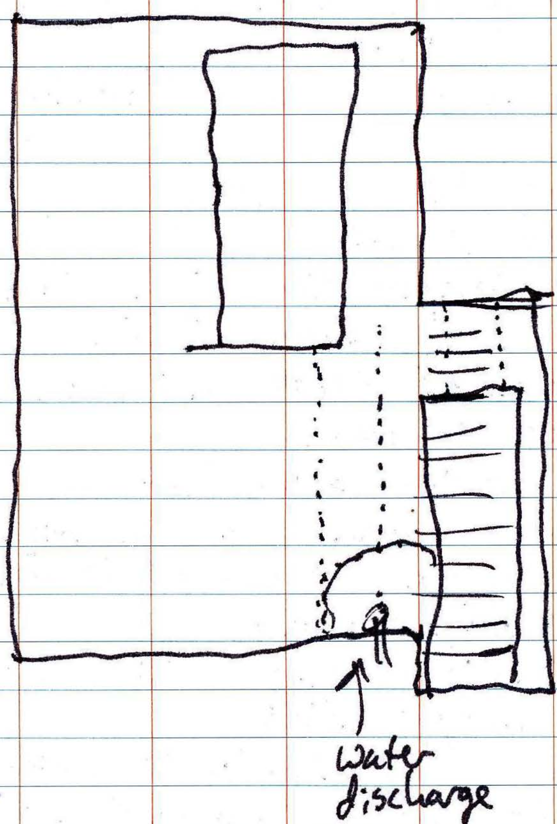
1 7/12/00

Arrived at Environmental conference room at 0930.
Mike Sickles, Amy, Bill Dowling from ADL

At Roll Mill at 1015
worked out Grid
First sample time 1027 from Grid Cell D-1 Sample S32
Thickness of waste less Than 1" maybe ½ inch.
Fines increase away from water discharge. Coarser close to discharge
Grid E-1 was too shallow to Sample not enough material
Grid E3 tried next sample time 1046 sample S33
Grid E-2 too shallow to sample
Grid A-3 Sample time 1105 S34
terry still calibrating pH meter and prepping pH samples
S35 A-4 sample time 1120 about ½" Thick
S36 A-5 sample time 1133
A-6 too shallow
B-6 too shallow
B-5 too shallow

TQ

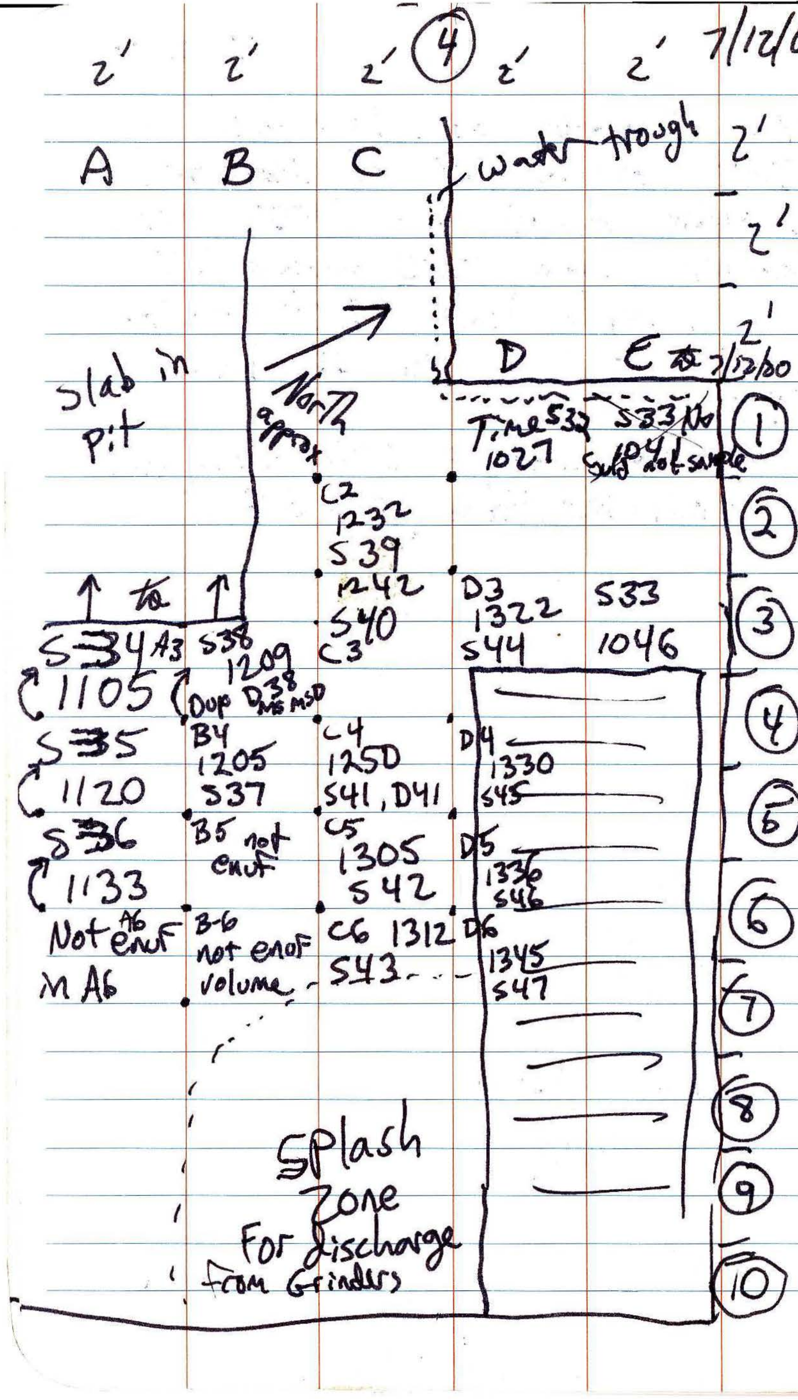
② 7/12/00



③ 7/12/00

1202 Demaree will try Grid
B-4 not a lot of material
Maybe enuf for 4oz. jars
Sample time 1205 sample S37
B3 sample time 1209 called
S38 will do MS/MSD from
S38
Duplicate sample D38 will also
be collected from grid B-3

Goto Next
Page



pH (5) 4 5 5 3 1 7/12/00

Calibration on pH meter 7.03 and 9.92 based on estimated temperature

S32 having trouble stabilizing reading because of too much oil in waste
At approx 10 minutes pH 6.80 but bounced from 6.60 and 7.12
20 minutes 6.25
40 minutes ~~6.11~~ ta 7/12 6.14 reading
stopped reading.
Because pH was around 7 and lower, Terry will do the next calibration at 7.0 and 4.0 instead of 7.0 and 10.0 like he did before
The 7.0 calibration dropped to ~~6.2~~ ta 7/12/00 5.97 approx.
1242 Sample time for C-3, sample number S40
1250 sample time for C-4, sample number S41
Duplicate D41 collected from C-4 same sample time

ta

(6) 7/12/00

Photo	View	Time	Desc
1-7	W/Down	1124	Sample collection at Grid A-4
1-8	~~NE~~ NW	1227	Terry recalibrating the pH meter after measuring S32
1-9	ENE	1303	Water flowing into Roll shop waste pit
1-10	W/Down	1334	Sampling at location D-4. Flash did not function
1-11	W/Down	1337	Sampling at D-5 water filling pit because sump.

(7) 7/12/00

1300 Finished with C-4
pH calibrated at 7.02 and 4.01 at 1304
1305 sample time for C-5
sample number S42
Terry running pH on S39
10 minute reading 5.44, 20 minute 5.87
1312 sample time for C-6 sample number S43
C-6 is as close to the water discharge as we could get

---

pH more steady on S39. Appears to be a better reading

1322 Sample time for D-3
Sample number S44
1330 Sample time for D-4
Sample number S45

---

pH 30 minutes for S39 6.06

1336 Sample time for D-5
Sample number S46

Apparently the sump kicked out
at around 1330 because
The pit started filling with water
Electrician showed up 1345 pump
started again on its own.
1345 Sample time for D-6
sample number S47
– pH Sample S45 being run
Unit stayed in fairly good calibration
around 6.90 after around 1 minute
after S39
10 minute reading 7.54, 15 minute Final reading 7.66

started packing up site
at 1351

Total of 16 samples collected
One MS/MSD at S38
One Dup at S38 = D38
Another Dup at S41 = D41

pH at S32 6.14 after 40 minutes
pH at S39 6.06 after 30 minutes
pH at S45 7.66 after 15 minutes

TA

1355 Final pH reading on 545 was 7.66. probes on pH meter were oily. Due to sump breakdown More water was in pit for 545 Than other samples

---

1400 left roll shop

JOB BOOK
FROM PENINSULAR PUBLISHING

PROJECT NAME LTV

PROJECT NUMBER

CREW Todd Quillen / Kristi Pawski

DATE 7/11/00 BOOK # 1 OF 1

WEATHER 77° humid overcast

FIELD BOOK
16 PAGE
8 LEAVES
50% RAG

CURVE FORMULAS

$T = R \tan \frac{1}{2} I$ | $R = T \cot. \frac{1}{2} I$ | Chord def. $= \frac{chord^2}{R}$

$T = \frac{50 \tan \frac{1}{2} I}{Sin. \frac{1}{2} D}$ | $R = \frac{50}{Sin. \frac{1}{2} D}$ | No. chords $= \frac{I}{D}$

Sin. $\frac{1}{2}$ D = $\frac{50}{R}$

Sin.

Th
the di
T
R
and di
R
the gi
T
by .01

PARAMOUNT ENVIRONMENTAL SERVICES

DAN GUNNUM
Ed DeLuca

Richard E. Schmidt, P.E., CHMM
PRESIDENT

cell & voice mail - **(219) 746-7186**

2554 Samuelson Rd.
Portage, IN 46368

7149 E. 46th St.
Indianapolis, IN 46226

RESchmidt@aol.com

1-800-303-8580
Fax (219) 762-8581

featuring Geoprobe® equipment

F
base.

Given Base 100, Alt. $10. 10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. $25. 25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875$ = Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

LEVELING. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574 d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3} d^2$. The combined correction is negative.

PROBABLE ERROR. If d_1, d_2, d_3, etc. are the discrepancies of various results from the mean, and if Σd^2 = the sum of the squares of these differences and n = the number of observations, then the probable error of the mean = $\pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$

MINUTES IN DECIMALS OF A DEGREE

1'	.0167	**11'**	.1833	**21'**	.3500	**31'**	.5167	**41'**	.6833	**51'**	.8500
2	.0333	**12**	.2000	**22**	.3667	**32**	.5333	**42**	.7000	**52**	.8667
3	.0500	**13**	.2167	**23**	.3833	**33**	.5500	**43**	.7167	**53**	.8833
4	.0667	**14**	.2333	**24**	.4000	**34**	.5667	**44**	.7333	**54**	.9000
5	.0833	**15**	.2500	**25**	.4167	**35**	.5833	**45**	.7500	**55**	.9167
6	.1000	**16**	.2667	**26**	.4333	**36**	.6000	**46**	.7667	**56**	.9333
7	.1167	**17**	.2833	**27**	.4500	**37**	.6167	**47**	.7833	**57**	.9500
8	.1333	**18**	.3000	**28**	.4667	**38**	.6333	**48**	.8000	**58**	.9667
9	.1500	**19**	.3167	**29**	.4833	**39**	.6500	**49**	.8167	**59**	.9833
10	.1667	**20**	.3333	**30**	.5000	**40**	.6667	**50**	.8333	**60**	1.0000

INCHES IN DECIMALS OF A FOOT

1-16	3-32	1/8	3-16	1/4	5-16	3/8	1/2	5/8	3/4	7/8
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

7/11/00

Arrived at Tin Mill Guard Shack at 0900

Met Drillers Dan Gunnum and Ed DeLuca.
IDEM Mike was There too.
Guard brought us to Al Cross' office
The Engineers who will help us locate
The utilities stopped by The meeting
1005 left meeting for Field
Arrived at Coke Processing area
We all arrived at site Then
took out GW sampling Equipment
and Terry, Demaree, and Kristi took
car with Al and others to visit
SWMUs
Amy Lawrence From ADL was
Going to oversee The GW sampling.
We stored Bottleware in her
locked car while I walked
The site with Mike Sickles (IDEM)
Kieth Nay (LTV Engineer-utilites/Coke operation)
Dick Rupnow (LTV Eng) and Kieth Nagel
(LTV Cincinatti Corporate) and Amy.

to

(2) 7/11/00

Photo	View	Time	Desc
1-1	SW	1235	On Location at S-01
1-2	SW	1322	S-02
1-3	~~W~~ 7/11/00 down	1457	Screen at S03 showing ring of potential product and apparent product smearing
1-4	W	1458	S03 from a distance
1-5	NW	1525	Collecting water sample at S04
1-6	N	1550	Sampling at S05 w/ mill in background

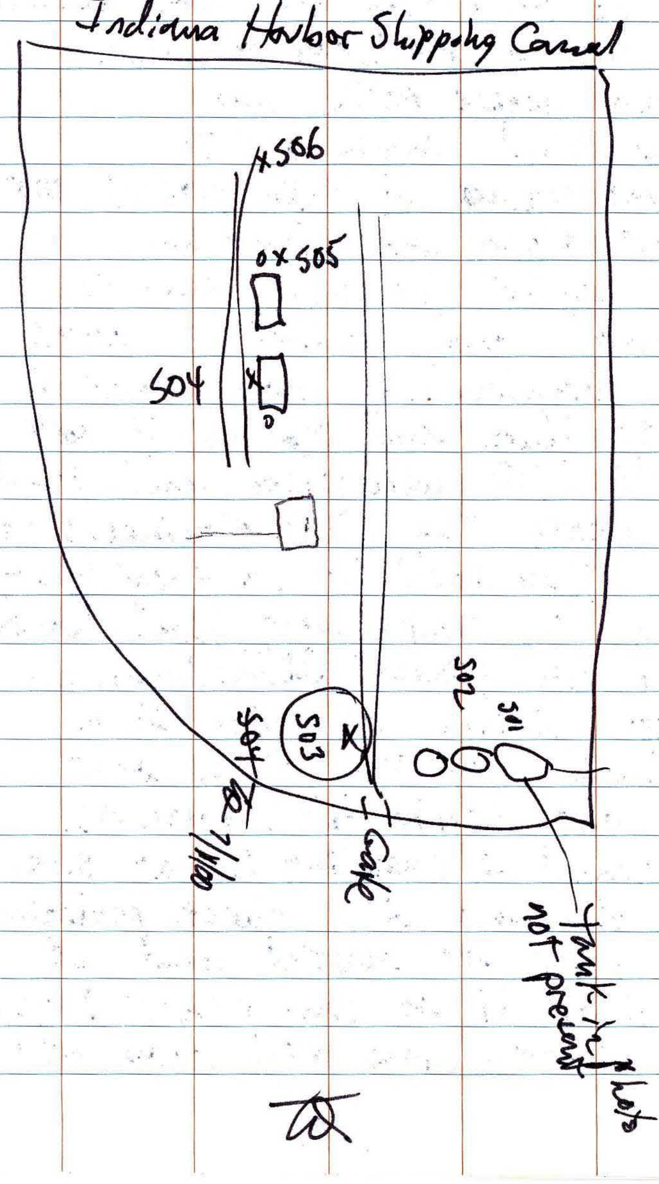
TQ

(3) 7/11/00

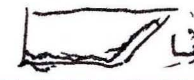
Mike was generally Familiar with a Truckers Map That was handed out at a pre sampling meeting several weeks/months ago
He said much of The Tank storage of Coke process were store along west fence line
We walked The site down to Canal and maked 2 areas for sampling. We came back to west fence and Marked 4 more spots. TQ identified and Marked all spots. The LTV Engineers told me They would let Me know where The 2 tanks were That handled The coke ~~process wastes~~ 7/11/00 decanting
12:00 Waiting at site with drillers. Amy, Mike, Kieth went to get drinks for Themselves.
I stayed w/ sampling Eq at site.
The engineers will check preliminarily The sites we marked and let us know if we can start drilling.
The Survey crew will come out

TQ

Inland Steel



around ~~12:30~~ 7/11/00 1230 or 1300
to precisely determine drill locations
to make sure there are no
utilities.
Keith Nay returned and gave us
the OK at 12:30 within 45 minutes
of checking, for S-01
1235 Started drilling
1240 done drilling prepped for
sampling
Water level 5.5 feet BGS according
to Driller's interface probe. Measurement
is approximate
Sample time 1250
Driller's deconned w/ 3 buckets &
Alcanox. Decon operation looked good.
Boring abandoned w/ bentonite chips
1320 on location at S02
10' of stem pushed into ground
15 Slot screen used
Similar to S01, S02 was black
when it started pumping and cleared
up after a while.
Sample Time 1335

 7/11/00

Rinsate blank collected
at 1350 after deconning S02
before S03. Called R03.
Water poured Through inside of
deconned bottom piece of stem.
1~~3~~400 - 1420 walked around and located
~~14~~ 7/11/00 S04, S05, and S06
1420 on location at S03
near maintance shed and offices
1st 2 tries hit foundation
Location 60' from end of center
Road in a line with North side of
3rd try foundation again
4th foundation again
Moved 40 feet South
Sample time S03 1445

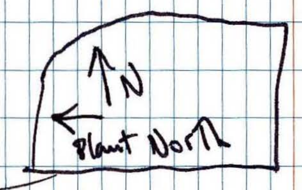
On location S04 at 1505 Hit foundation moved
S04 115' ~~50~~ 7/11 East of
building near end of
utility bridge, 40' from center
of "North" decanter, 30 South
of road
Water Level 5.5 feet Pump intake
at 8 feet at bottom of screen

tc

7/11/00

Sample Time For S04 is 1520

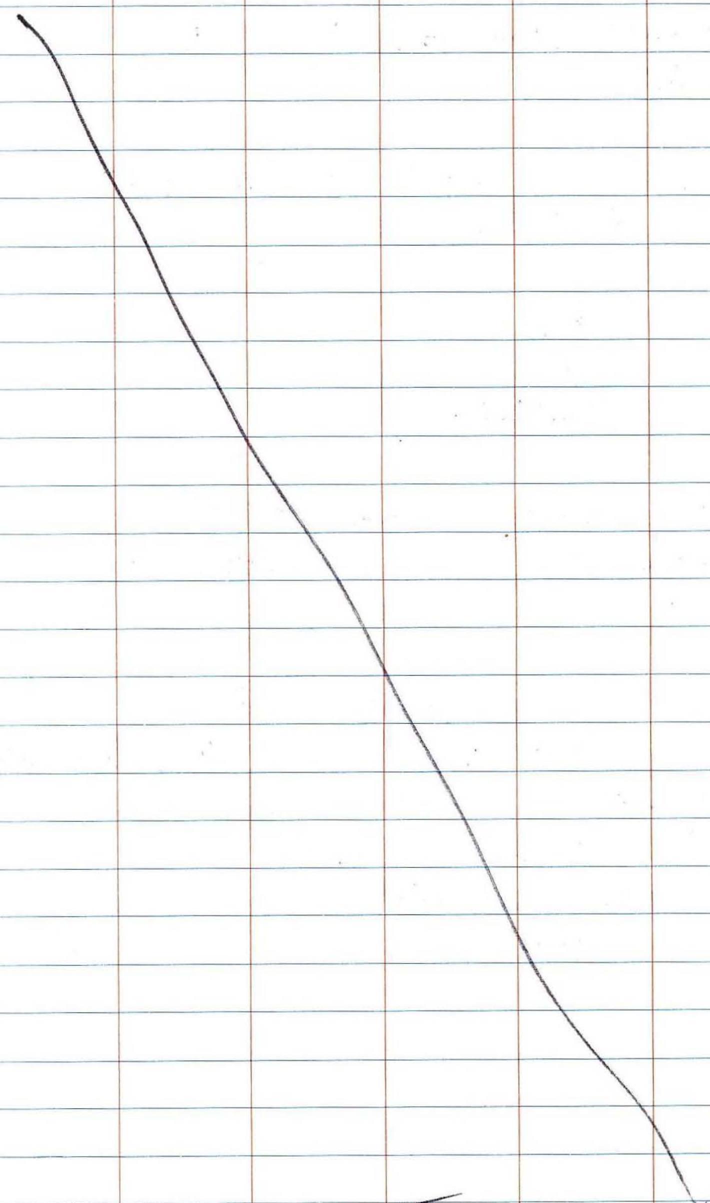
1545 on location at southeast side of "South" decanter



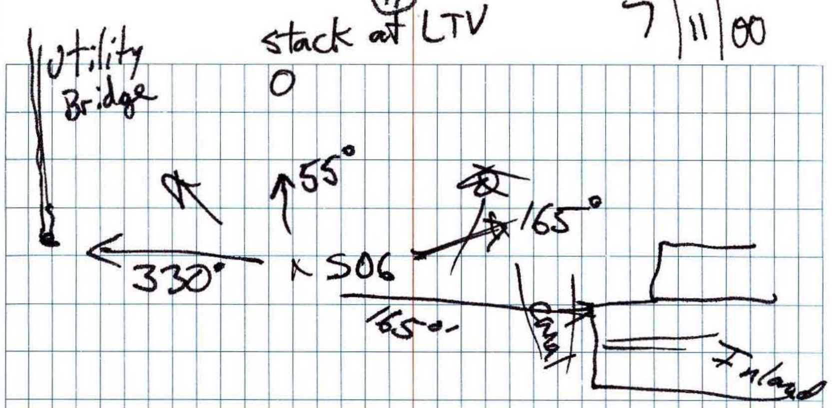
1555 Sample Time for S05
Duplicate D05 collected at D05

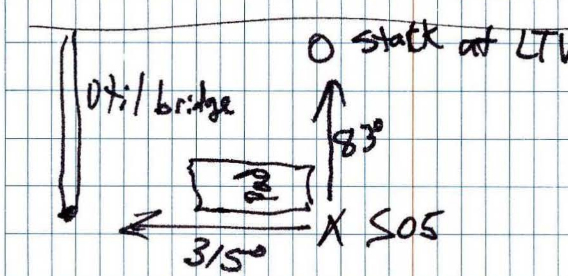
1635 On location at S06
200' From canal, in line w/Inland building
between 2 roads, near
old amonia operation
Sample Time 1650
Water level 6' Tube set at 8'

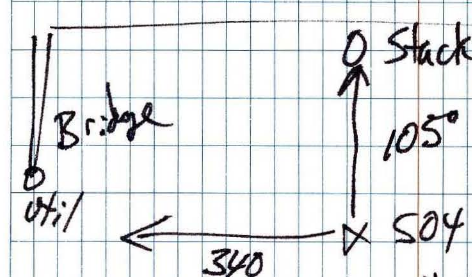
tc

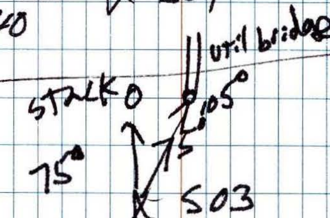


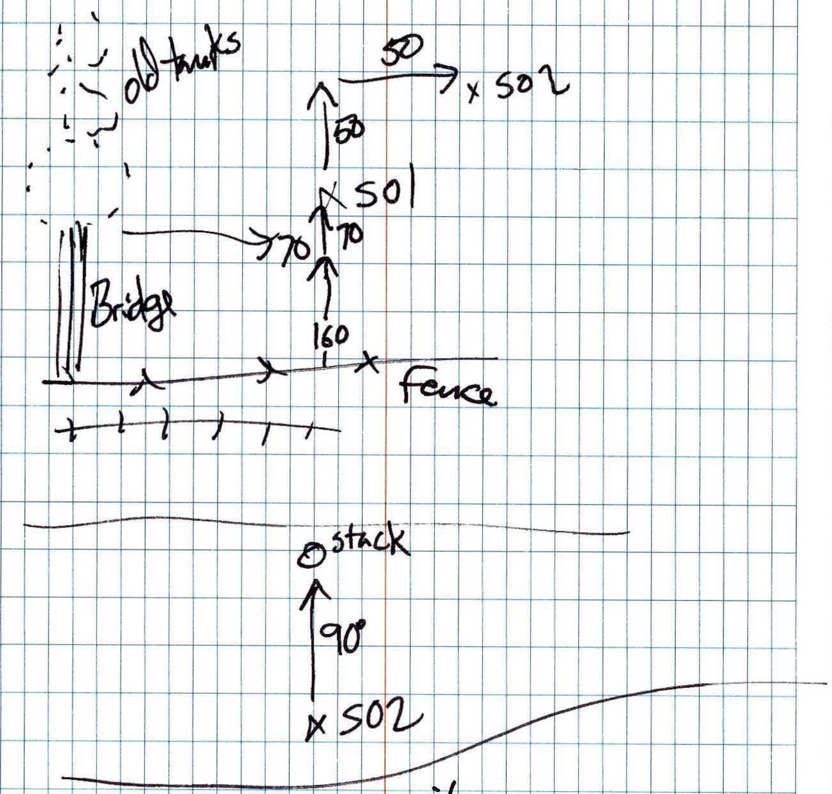
7/11/00


stack at LTV
Utility Bridge
55°
330°
x S06
165°
165°
Inland


O stack at LTV
Util bridge
83°
315°
X S05


O Stack
Bridge
Util
105°
340
X S04


util bridge
stack O
105°
75°
75°
X S03



1730 left site

PPE Level D
Paperwork at office until 2000

End of Log

JOB BOOK

FROM PENINSULAR PUBLISHING

PROJECT NAME LTV

PROJECT NUMBER K05705

CREW D. COLLIER, T. UECKER, K. PAWSKI

DATE 7/11/00 BOOK # 1 OF ____

WEATHER ____

FIELD BOOK
16 PAGE
8 LEAVES
50% RAG

CURVE FORMULAS

$T = R \tan \frac{1}{2} I$	$R = T \cot. \frac{1}{2} I$	Chord def. $= \frac{\text{chord}^2}{R}$
$T = \frac{50 \tan \frac{1}{2} I}{\text{Sin.} \frac{1}{2} D}$	$R = \frac{50}{\text{Sin.} \frac{1}{2} D}$	No. chords $= \frac{I}{D}$
$\text{Sin.} \frac{1}{2} D = \frac{50}{R}$	$E = R \text{ ex. sec } \frac{1}{2} I$	Tan. def. $= \frac{1}{2}$ chord def.
$\text{Sin.} \frac{1}{2} D = \frac{50 \tan \frac{1}{2} I}{T}$	$E = T \tan \frac{1}{4} I$	

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.) and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

RIGHT ANGLE TRIANGLES. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. 10. $10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. 25. $25^2 \div 200 = 3.125$; $100 - 3.125 = 96.875$ = Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

LEVELING. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574 d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3} d^2$. The combined correction is negative.

PROBABLE ERROR. If d_1, d_2, d_3, etc. are the discrepancies of various results from the mean, and if Σd^2 = the sum of the squares of these differences and n = the number of observations, then the probable error of the mean = $\pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$

MINUTES IN DECIMALS OF A DEGREE

1'	.0167	**11'**	.1833	**21'**	.3500	**31'**	.5167	**41'**	.6833	**51'**	.8500
2	.0333	**12**	.2000	**22**	.3667	**32**	.5333	**42**	.7000	**52**	.8667
3	.0500	**13**	.2167	**23**	.3833	**33**	.5500	**43**	.7167	**53**	.8833
4	.0667	**14**	.2333	**24**	.4000	**34**	.5667	**44**	.7333	**54**	.9000
5	.0833	**15**	.2500	**25**	.4167	**35**	.5833	**45**	.7500	**55**	.9167
6	.1000	**16**	.2667	**26**	.4333	**36**	.6000	**46**	.7667	**56**	.9333
7	.1167	**17**	.2833	**27**	.4500	**37**	.6167	**47**	.7833	**57**	.9500
8	.1333	**18**	.3000	**28**	.4667	**38**	.6333	**48**	.8000	**58**	.9667
9	.1500	**19**	.3167	**29**	.4833	**39**	.6500	**49**	.8167	**59**	.9833
10	.1667	**20**	.3333	**30**	.5000	**40**	.6667	**50**	.8333	**60**	1.0000

INCHES IN DECIMALS OF A FOOT

1-16	3-32	⅛	3-16	¼	5-16	⅜	½	⅝	¾	⅞
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

DATE: 7/11/00

900 - Arrived at the site

930 - met w/ Al Cross & Mr. Nagel of LTV in conference room to discuss the sampling.

set up sampling schedule

→ Engineers to go to Coke Plant (SWMU 65) to ID lines - may take a day will try to help identify old Decanter Pits.
TEAM 1

Team 2 - will go to other SWMUs to do soil sampling.

WEATHER IS SUNNY WITH A SLIGHT WIND.

KP

KP

10:30
met at SWMU 65. Discussed groundwater sampling locations and unloaded groundwater sampling supplies.

10:53
T. Uecker, D. Collier, K. Pawski, Al Cross and LTV Contractors drove to SWMU 45.

10:58
Set up to sample.

PHOTO #1 7/11/00 PHOTOGRAPHER: K. PAWSKI
TIME: 11:07 DIRECTION: SW
7/11/00 KP ~~SW~~ SWMU 45 WASTE SODIUM DICHROMATE LOADING STATION
NOTE: BLUE STAINING PRESENT DURING VSI IS NOT PRESENT.

KP

④ DATE: 7/11/00

KP

DATE: 7/11/00 ⑤

PHOTO #2 7/11/00 TIME: 11:12 DIRECTION: SE
WASTE SODIUM DICHROMATE LOADING STATION
PHOTOGRAPHER: K. PAWSKI
NOTE: GRAVEL APPEARS TO BE FRESHLY SCRAPED. NOTE THE STRAIGHT LINES IN THE GRAVEL. NO APPARENT BLUE STAINING.

TIME: 11:17
SET UP DECON. AREA.
DECONNED BUCKET TO BE USED FOR EQUIPMENT DECONTAMINATION.

TIME: 11:23
DISCUSSED LOCATION OF SAMPLE LOCATIONS FOR SWMU 45.

PHOTO #3 TIME: 11:25
7/11/00 DIRECTION: SW
WASTE SODIUM DICHROMATE LOADING STATION
PHOTOGRAPHER K. PAWSKI
NOTE: COLLECTION OF SOIL SAMPLE AT SWMU 45.

KP

6

DATE: 7/11/00

KP

DATE: 7/11/00

7

TIME: 11:25 LOCATION: WASTE SODIUM DICHROMATE LOADING STATION
BEGAN SAMPLING AT SWMU 45.
COLLECTED COMPOSITE FOR SAMPLE NUMBER 2000RC02S16. TOOK COMPOSITE FROM FOUR LOCATIONS, EACH APPROX. 1 FT. APART, ALONG SE. SIDE OF LOADING STATION.

PHOTO #4 TIME: 11:30
7/11/00 DIRECTION: SW
PHOTOGRAPHER: K. PAWSKI
SWMU 45 - WASTE SODIUM DICHROMATE LOADING STATION
NOTE: COLLECTION OF COMPOSITE SAMPLE NUMBER 2000RC02S16.

TIME: 11:37 LOCATION: WASTE SODIUM DICHROMATE LOADING STATION
SPLIT SAMPLE NUMBER 2000RC02S16 WITH LTV CONTRACTOR

TIME: 11:43 LOCATION: WASTE SODIUM DICHROMATE LOADING STATION
COLLECTED DUPLICATE SAMPLE NUMBER 2000RC02D16. SPLIT SAMPLE WITH LTV CONTRACTOR.

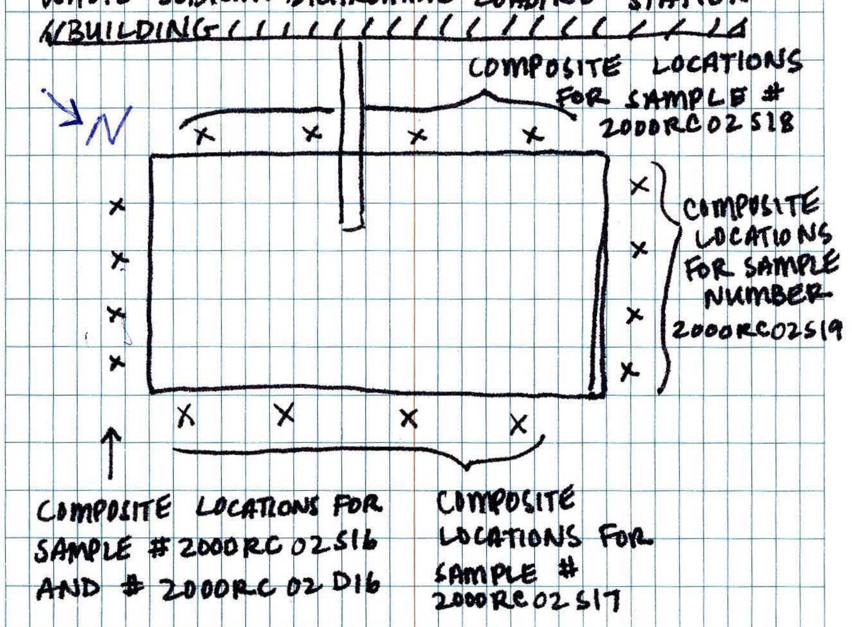
KP

8 DATE: 7/11/00

KP

DATE: 7/11/00 9

DESCRIPTION: LOCATION OF COMPOSITE SAMPLE LOCATIONS FOR SAMPLES AT SWMU 45 WASTE SODIUM DICHROMATE LOADING STATION



TIME: 11:48

LOCATION: SWMU 45

BEGAN SAMPLE COLLECTION FOR SAMPLE NUMBER 2000RC02S17

SAMPLE COMPOSITES COLLECTED ALONG NE EDGE OF LOADING STATION. SAMPLE COMPOSITED FROM FOUR (4) LOCATIONS, EACH APPROXIMATELY 2-3 FT. APART.

KP

10

DATE: 7/11/00

KP

DATE: 7/11/00

11

PHOTO #5 TIME: 11:53 DIRECTION: NE
7/11/00 LOCATION: SWMU 45
WASTE SODIUM DICHROMATE LOADING STATION
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE NUMBER
2000RC02S17.

TIME: 12:00
LOCATION: SWMU 45
BEGAN COLLECTION OF SAMPLE NUMBER
2000RC02S18 FROM SW EDGE OF
LOADING STATION.

PHOTO #6 TIME: 12:01
7/11/00 DIRECTION: S
LOCATION: SWMU 45
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE #2000RC02S18
FROM SW EDGE OF LOADING STATION.

TIME: 12:08
LOCATION: SWMU 45
BEGAN COLLECTION OF SAMPLE NUMBER
2000RC02S19

KP

(12) DATE: 7/11/00

KP

DATE: 7/11/00 (13)

PHOTO #7 TIME: 12:13
7/11/00 DIRECTION: NE
LOCATION: SWMU 45
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE NUMBER 2000RC02S19 FROM NW EDGE OF LOADING STATION.

PHOTO #8 TIME: 12:19
7/11/00 DIRECTION: NW
LOCATION: SWMU 45
PHOTOGRAPHER: K. PAWSKI
NOTE: EQUIPMENT DECONTAMINATION AFTER SAMPLING AT SWMU 45.

TIME: 12:35
ARRIVED AT SWMU 50, NO. 2 TIN MILL WASTE CHROMIC ACID TANK
NOTE: TANK IMMEDIATELY SW OF CONCRETE COVERS MOST OF THE ADJACENT GROUND.

PHOTO #9 TIME: 12:37
7/11/00 DIRECTION: NNE
LOCATION: SWMU 50
PHOTOGRAPHER: K. PAWSKI
NOTE: TANK IMMEDIATELY SW OF CONCRETE PAD COVERS GROUND AREA ADJACENT TO CONCRETE.

KP

(14) DATE: 7/11/00

KP

DATE: 7/11/00 (15)

PHOTO #10 TIME: 12:41
7/11/00 DIRECTION: SE
LOCATION: SWMU 50
PHOTOGRAPHER: K. PAWSKI
NOTE: TANK AND CONCRETE PAD AT SWMU 50

TIME: 12:44
LOCATION: SWMU 50
WATER HAS ACCUMULATED ON THE GROUND UNDER THE CHROMIC ACID TANK. WATER APPEARS CLEAR, WITH NO VISIBLE SHEEN. A LARGE GRATE IS PRESENT APPROX. 3 INCHES UNDER WATER LEVEL, BUT DOES NOT APPEAR TO BE DRAINING THE WATER.

TIME: 12:43
LOCATION: SWMU 50
SAMPLE# 2000RC02S20
BEGAN SAMPLE COLLECTION.

TIME: 12:48
LOCATION: SWMU 50
SAMPLE# 2000RC02S21
BEGAN SAMPLE COLLECTION.

KP

(16) DATE: 7/11/00

KP

DATE: 7/11/00 (17)

PHOTO #11 TIME: 12:50
DATE: 7/11/00 DIRECTION: NW
LOCATION: SWMU 50
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE # 2000RC02S20, A COMPOSITE OF FIVE (5) SAMPLES FROM W AND NW EDGE OF CHROMIC ACID TANK AREA. SAMPLES ARE APPROX. 3-4 FT. APART

PHOTO #12 TIME: 12:52
DATE: 7/11/00 DIRECTION: E
LOCATION: SWMU 50
PHOTOGRAPHER: K. PAWSKI
NOTE: COMPOSITING SAMPLE # 2000RC02 S21 FROM ALONG SE EDGE OF CHROMIC ACID TANK AREA. SAMPLES ARE APPROX. 2-3 FT. APART.
ALL SAMPLES IN THIS AREA ARE COLLECTED FROM 1-3 INCHES IN DEPTH. PACKED GRAVEL AND SLAG MADE COLLECTION OF DEEPER SAMPLES DIFFICULT.

KP

(18) DATE: 7/11/00

KP

DATE: 7/11/00 (19)

PHOTO # 13 TIME: 12:57
DATE: 7/11/00 DIRECTION: NNE
LOCATION: SWMU 50
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTED (RAIN)WATER IS CLEAR, WITH NO VISIBLE SHEEN. NOTE GREEN-COLORED SUBSTANCE ON CONCRETE BENEATH WATER.

TIME: 13:00
ACCORDING TO AL CROSS (LTV) WATER UNDER CHROMIC ACID TANK IS RAINWATER.
THE GRATE ON THE S END OF THE COLLECTED WATER IS A SUMP USED TO PUMP WATER COLLECTED IN THIS AREA. THE PUMPED WATER IS ADDED TO FACILITY PROCESS WATER. GREEN SUBSTANCE BENEATH WATER SAID TO BE MOSS (AL CROSS).

PHOTO # 14 TIME: 12:58
DATE: 7/11/00 DIRECTION: S
LOCATION: SWMU 50
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE #2000RC02S22 COMPOSITE OF FIVE(5) SAMPLES COLLECTED FROM ALONG THE SW EDGE OF THE CHROMIC ACID TANK AREA.
SAMPLES ARE APPROX. 2-3 FT. APART.
KP

(20) DATE: 7/11/00

KP

DATE: 7/11/00 (21)

PHOTO #15 TIME: 13:00
DATE: 7/11/00 DIRECTION: SE
LOCATION: SWMU 50
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE # 2000RC02S23 FROM ALONG SE EDGE OF CHROMIC ACID TANK AREA. COMPOSITE OF FOUR (4) SAMPLES.

~~PHOTO #16~~ ~~TIME:~~ 7/11/00 KP

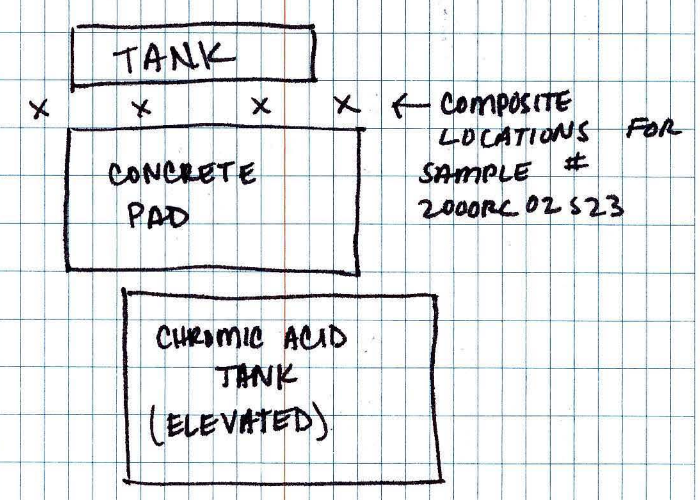
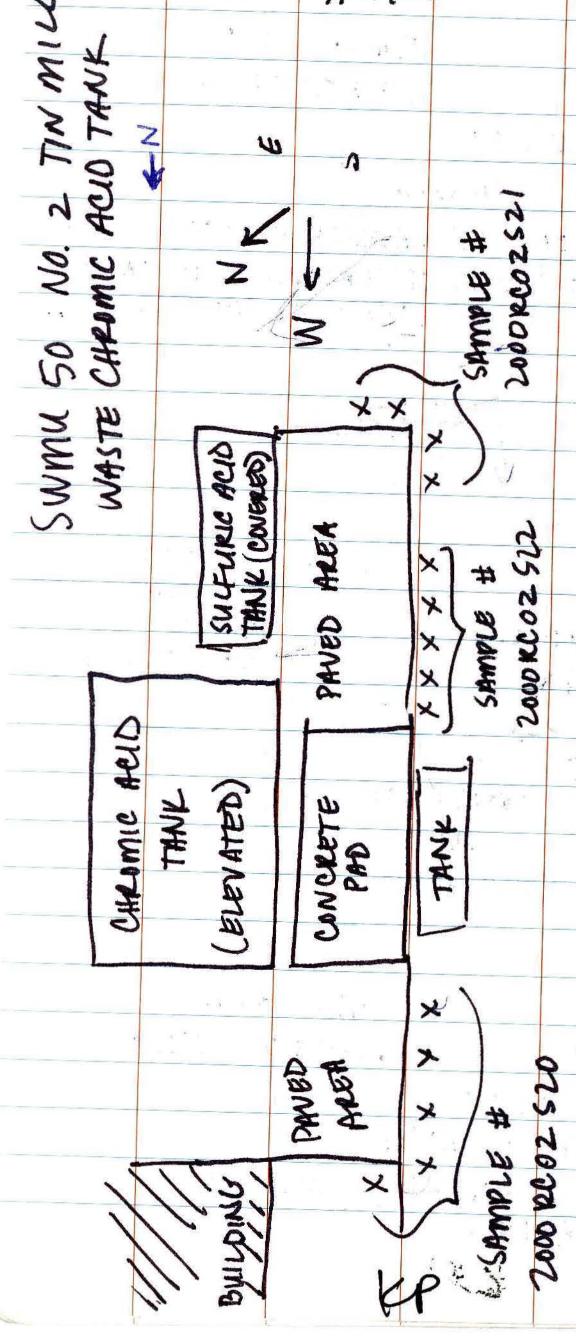


PHOTO #16 TIME: 1322
DATE: 7/11/00 DIRECTION: NNW
LOCATION: SWMU 50
PHOTOGRAPHER: K. PAWSKI
NOTE: VIEW OF ENTIRE SWMU 50 SAMPLING AREA.

KP

DATE: 7/11/00



KP

DATE: 7/11/00

TIME: 1325
LOCATION: SWMU 50
WHEN ALCONOX AND DI WATER FROM EQUIPMENT DECON WERE POURED INTO THE GRATE, SAID TO BE A SUMP, UNDER THE CHROMIC ACID TANK, THE WATER TURNED GREEN AND BEGAN TO BUBBLE.

TIME: 1330
LEFT SWMU 50 AND DROVE TO SWMU 65, COKE PLANT.

TIME: 1335
ARRIVED AT SWMU 65, COKE PLANT. BROKE FOR LUNCH.

TIME: 1450
RECONVENED AND DROVE TO SWMU 11

LTV IS IN THE PROCESS OF INSTALLING A PAD UNDERNEATH THE LMF. THIS AREA IS CURRENTLY COVERED WITH THICK PLASTIC SHEETS. A ROLL-OFF BOX IS LOCATED DIRECTLY ADJACENT TO THE LMF TO THE NW. THE ROLL-OFF IS USED TO COLLECT CADMIUM DUST. THE ROLL-OFF IS COVERED. ACCORDING TO AL CROSS (LTV) THE BOX IS ALWAYS COVERED.

KP.

DATE: 7/11/00

CADMIUM DUST ENTERS THE ROLL-OFF THROUGH A CONTAINED CONVEYOR. NO DUST WAS OBSERVED ESCAPING TO THE ENVIRONMENT.

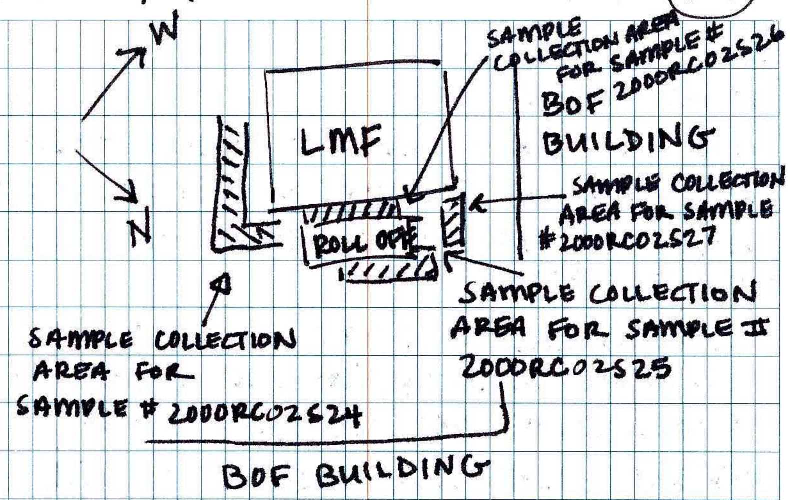
PHOTO #17 TIME: 1500
DATE 7/11/00 DIRECTION: E
LOCATION: LMF
PHOTOGRAPHER: K. PAWSKI
NOTE: ROLL-OFF BOX CONTAINING CADMIUM DUST.

PHOTO #18 TIME: 1501
DATE 7/11/00 DIRECTION: E
LOCATION: LMF
PHOTOGRAPHER: K. PAWSKI
NOTE: ROLL-OFF BOX AND AREA BENEATH LMF.

TIME: 1505
LOCATION: LMF
BEGAN COLLECTION OF SAMPLE #2000RC02 S24. THE SAMPLE WAS COLLECTED FROM THE NE AND SE SIDES OF THE LMF. DUE TO THE SHALLOW DEPTH OF SOIL IN THIS AREA, THE SAMPLE WAS COLLECTED BY SWEEPING AN AREA 1-2 FT. WIDE WITH A PLASTIC SPOON. THE COLLECTED MATERIAL WAS COMPOSITED IN A PLASTIC BOWL.

KP

DATE: 7/11/00



TIME: 1505
LOCATION: LMF
BEGAN COLLECTION OF SAMPLE #2000RC02S25. THE SAMPLE WAS COLLECTED FROM THE AREA UNDER AND AROUND THE ROLL-OFF BOX. DUE TO THE SHALLOW DEPTH OF SOIL, THE SAMPLE WAS COLLECTED BY SWEEPING AN AREA APPROXIMATELY 3 FT. BY 15 FT. WITH A SPOON. THE COLLECTED MATERIAL WAS THEN COMPOSITED IN A PLASTIC BOWL.

TIME: ~~1520~~ 1525
LOCATION: LMF
BEGAN COLLECTION OF SAMPLE # 2000RC02 ~~S26~~ S27. THE SAMPLE WAS COLLECTED FROM THE AREA NE AND NW OF THE LMF. THE SAMPLE WAS COLLECTED BY SWEEPING AN AREA 2FT. BY 6FT. WIDE WITH A PLASTIC SPOON. THE COLLECTED MATERIAL WAS THEN COMPOSITED IN A PLASTIC BOWL. KP

26 DATE: 7/11/00

TIME: 1525
LOCATION: LMF
BEGAN COLLECTING SAMPLE # 2000RC02-~~S27~~-S26
THE SAMPLE WAS COLLECTED FROM A 2FT. BY 15FT. AREA UNDER AND AROUND THE ROLL-OFF BOX WITH A PLASTIC SPOON.

DURING SAMPLING, IT WAS OBSERVED THAT SOIL DEEPER THAN 1/4 INCH HAD A YELLOW-COLORED TINGE THAT WAS SIGNIFICANTLY DIFFERENT THAN THE UPPERMOST 1/4 INCH OF SOIL.
AFTER THE SOIL WAS COLLECTED IN A PLASTIC BOWL, IT WAS COMPOSITED BEFORE BEING PUT INTO SAMPLE JARS.
ALL SAMPLES WERE SPLIT WITH THE LTV CONTRACTOR (S24, S25, S26, S27) AFTER BEING COMPOSITED.

TIME: 1535
LOCATION: LMF
SAMPLING IN THIS LOCATION WAS COMPLETED AND SAMPLING EQUIPMENT WAS DECONNED.

SOIL IN THE AREA SURROUNDING THE LMF CONTAINED "SHINY" PIECES, THE SIZE OF A GRAIN OF SAND. ACCORDING TO AL CROSS (LTV), THESE ARE SMALL PIECES OF METAL THAT ESCAPE FROM CERTAIN OPERATIONAL AREAS OF THE FACILITY. KP

DATE: 7/11/00 27

PHOTO #19 TIME: 1536
DATE: 7/11/00 DIRECTION: SW
LOCATION: LMF
~~LMF~~ 7/11/00 KP PHOTOGRAPHER: K. PAWSKI
NOTE: AREA SWEPT FOR SAMPLE #2000RC~~24~~02S24

PHOTO #20 TIME: 1538
DATE: 7/11/00 DIRECTION: SE
LOCATION: LMF
PHOTOGRAPHER: K. PAWSKI
NOTE: AREA SWEPT FOR SAMPLE #2000RC02S25

PHOTO #21 TIME: 1539
DATE: 7/11/00 DIRECTION: SW
LOCATION: LMF
PHOTOGRAPHER: K. PAWSKI
NOTE: AREA SWEPT FOR SAMPLE #2000RC02S27

PHOTO #22 TIME: 1540
DATE: 7/11/00 DIRECTION: NW
LOCATION: LMF
PHOTOGRAPHER: K. PAWSKI
NOTE: AREA SWEPT FOR SAMPLE# 2000RC02S26.
KP

28 DATE: 7/11/00

PHOTO #23 TIME: 1542
DATE: 7/11/00 DIRECTION: SE
LOCATION: LMF
PHOTOGRAPHER: K. PAWSKI
NOTE: DECONTAMINATION OF SAMPLING EQUIPMENT AFTER SAMPLING AT LMF.

TIME: 1550
DEPARTED FROM SWMU 11

TIME: 1555
ARRIVED AT SPENT PICKLE LIQUOR TANKS. STAINING IS EVIDENT DOWN THE SIDES OF THE CONCRETE STANDS UNDER THE TANKS. ONE LARGE AREA OF STAINING IS PRESENT ON THE GROUND IN FRONT OF THE TANKS. A CONCRETE PAD EXTENDS APPROX. 8 FT. IN FRONT (SSW) OF THE TANKS AND APPROX. 10 FT. TO THE WNW OF THE TANKS. THE CONCRETE PAD HAS A SMALL DRAIN NEAR ITS SE END. STANDING WATER ON THE SE END OF THE PAD IS A NOTICEABLY ORANGE-RED COLOR. THIS IS THE SAME COLOR AS THE STAINS ON THE CONCRETE STAND AND THE CONCRETE PAD.
KP

DATE: 7/11/00 29

PHOTO #24 TIME: 1607
DATE: 7/11/00 DIRECTION: E
LOCATION: SWMU 28/29-SPENT PICKLE LIQUOR TANKS
PHOTOGRAPHER: K. PAWSKI
NOTE: VIEW OF THE SPENT PICKLE LIQUOR (FERROUS CHLORIDE) TANKS. NOTE THE ORANGE-RED STAINING ON THE CONCRETE STAND AND THE CONCRETE PAD.

TIME: 1607
COLLECTED RINSATE BLANK 2000RC02B27

TIME: 1615
LOCATION: SWMU 28/29
BEGAN COLLECTION OF SAMPLE #2000RC02S28. SAMPLE COLLECTED FROM THE SE EDGE OF THE TANKS, ALONG THE CONCRETE STAND (RIGHT AGAINST THE WALL). THE SAMPLE IS COMPOSITED FROM FIVE (5) SAMPLES COLLECTED WITH A STAINLESS STEEL SPOON AND COMPOSITED IN A PLASTIC BOWL.
TIME: 1617
BEGAN COLLECTION OF SAMPLE #2000RC02S29. SAMPLE COLLECTED FROM THE SE EDGE OF THE CONCRETE PAD AND THE NE EDGE OF THE CONCRETE PAD. THE SAMPLE IS COMPOSITED FROM FIVE (5) SAMPLES COLLECTED WITH A STAINLESS STEEL SPOONS AND COMPOSITED IN A PLASTIC BOWL.
KP

30 DATE: 7/11/00

PHOTO #25 TIME: 1618
DATE: 7/11/00 DIRECTION: NNE
LOCATION: SWMU 28/29
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE 2000RC02S28.
NOTE THE REDDISH SOIL STAIN.

PHOTO #26 TIME: 1621
DATE: 7/11/00 DIRECTION: NNE
LOCATION: SWMU 28/29
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE #2000RC02S29.
NOTE THE REDDISH-ORANGE STAINS ON THE CONCRETE AND THE RED-ORANGE COLOR OF THE SMALL PUDDLE OF STANDING WATER.

TIME: 1632
LOCATION: SWMU 28/29
BEGAN COLLECTION OF SAMPLE #2000RC02S30.
SAMPLE COLLECTED ON WNW SIDE OF TANKS.
THE SAMPLE IS COMPOSITED FROM FIVE (5) SAMPLES COLLECTED WITH A STAINLESS STEEL SPOON AND COMPOSITED IN A PLASTIC BOWL.

KP

DATE: 7/11/00 31

PHOTO #27 TIME: 1636
DATE: 7/11/00 DIRECTION: NNE
LOCATION: SWMU 28/29
PHOTOGRAPHER: K. PAWSKI
NOTE: COLLECTION OF SAMPLE #2000RC02S30.
THE SOIL IN THIS AREA IS SIGNIFICANTLY MORE ORANGE-RED IN COLOR THAN SOIL 5 FT. FURTHER AWAY FROM THE TANKS.

NOTE: SAMPLE NUMBER S31 IS A BLIND DUPLICATE FOR SAMPLE NUMBER S29 - SENT TO ENCHEM LABORATORY.

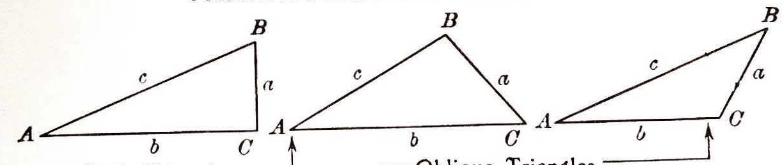
TIME: 1730
DEPARTED LTV FACILITY.

KP

32

KP

TRIGONOMETRIC FORMULAS



Right Triangle — Oblique Triangles

Solution of Right Triangles

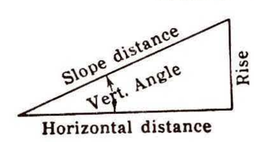
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

Given	Required	
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B$, $c = \sqrt{a^2+b^2} = a\sqrt{1+\frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B$, $b = \sqrt{(c+a)(c-a)} = c\sqrt{1-\frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90° - A$, $b = a \cot A$, $c = \frac{a}{\sin A}$
A, b	B, a, c	$B = 90° - A$, $a = b \tan A$, $c = \frac{b}{\cos A}$
A, c	B, a, b	$B = 90° - A$, $a = c \sin A$, $b = c \cos A$

Solution of Oblique Triangles

Given	Required	
A, B, a	b, c, C	$b = \frac{a \sin B}{\sin A}$, $C = 180° - (A+B)$, $c = \frac{a \sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b \sin A}{a}$, $C = 180° - (A+B)$, $c = \frac{a \sin C}{\sin A}$
a, b, C	A, B, c	$A + B = 180° - C$, $\tan \frac{1}{2}(A-B) = \frac{(a-b)\tan\frac{1}{2}(A+B)}{a+b}$, $c = \frac{a \sin C}{\sin A}$.
a, b, c	A, B, C	$s = \frac{a+b+c}{2}$, $\sin\frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}$, $\sin\frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}}$, $C = 180° - (A+B)$
a, b, c	Area	$s = \frac{a+b+c}{2}$, area $= \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	area $= \frac{bc \sin A}{2}$
A, B, C, a	Area	area $= \frac{a^2 \sin B \sin C}{2 \sin A}$

REDUCTION TO HORIZONTAL

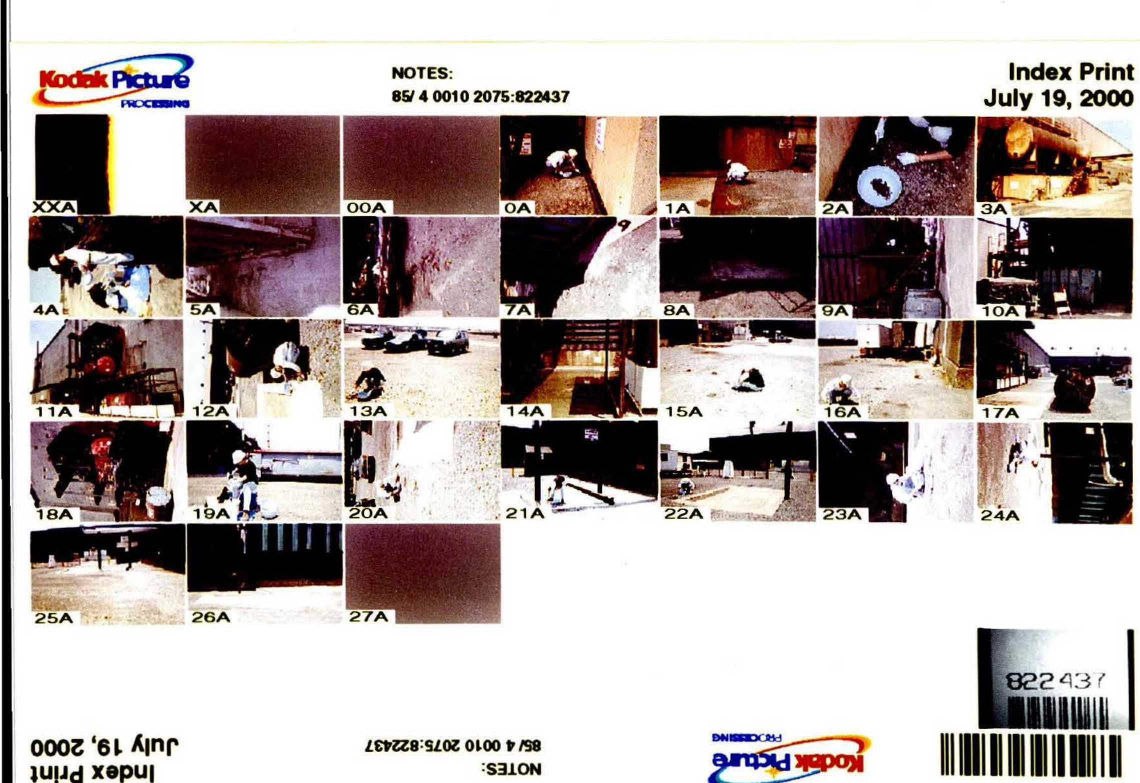


Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10′. Since cos 5° 10′ = .9959, horizontal distance = 319.4 × .9959 = 318.09 ft.

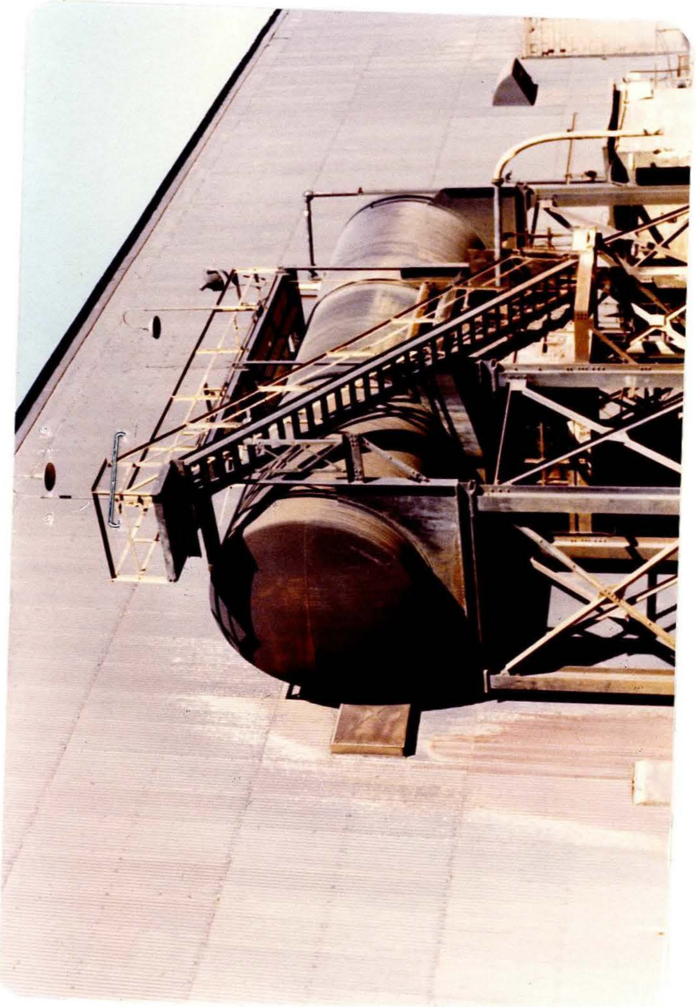
Horizontal distance also = Slope distance minus slope distance times (1 − cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10′ = .9959. 1 − .9959 = .0041. 319.4 × .0041 = 1.31. 319.4 − 1.31 = 318.09 ft.

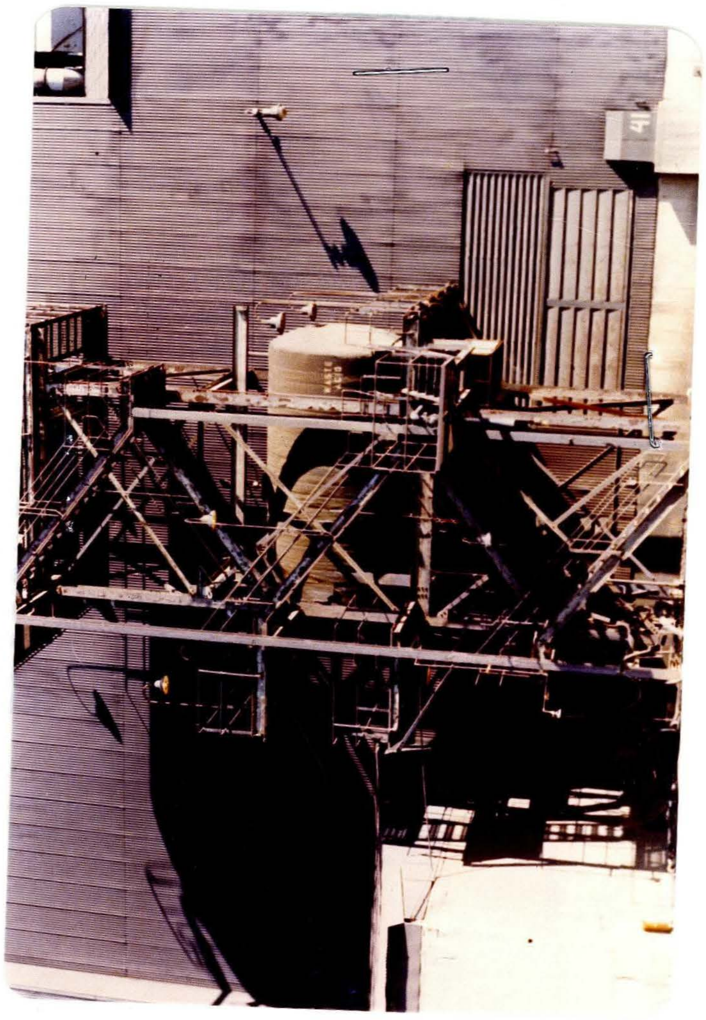
When the rise is known, the horizontal distance is approximately the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance $= 302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.


NOTES:
85/ 4 0008 2075:822439
Index Print
July 19, 2000
XXA XA 00A 0A 1A 2A 3A
4A 5A 6A 7A 8A 9A 10A
11A 12A 13A 14A 15A 16A 17A
18A 19A 20A 21A 22A 23A 24A
25A 26A 27A
822439


NOTES:
85/ 4 0010 2075:822437
Index Print
July 19, 2000
XXA XA 00A 0A 1A 2A 3A
4A 5A 6A 7A 8A 9A 10A
11A 12A 13A 14A 15A 16A 17A
18A 19A 20A 21A 22A 23A 24A
25A 26A 27A
822437


IN



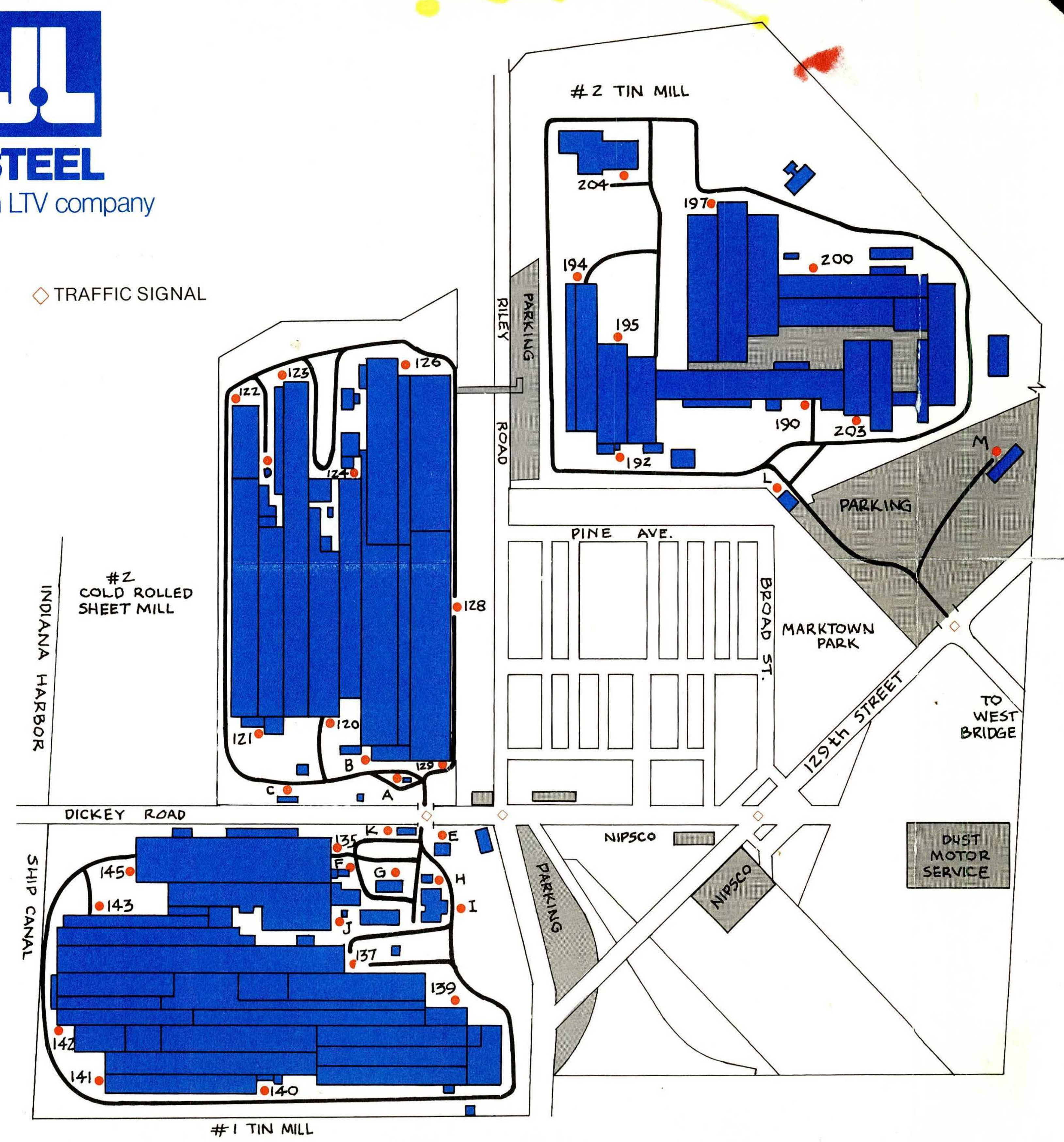


STEEL
an LTV company

#2 COLD ROLLED SHEET MILL
- 120 Annealing, Pickler, 4-stand, Shear Line, Temper Mill, Quality Control, Labor, T.M. Pipe and Bridge Shop.
- 121 Dock #71 (Billing Office).
- 122 Dock #72
- 123 Pickler Acid.
- 124 Roll Shop.
- 126 Galvanizer, Dock #74.
- 128 Annealing.
- 129 Annealing fuel oil, T.M. Pipe and Bridge Shop.
- A #2 CRSM Gate.
- B Superintendent, Payroll, Industrial Relations.
- C #2 CRSM Truck Scale.
- D Boilerhouse.

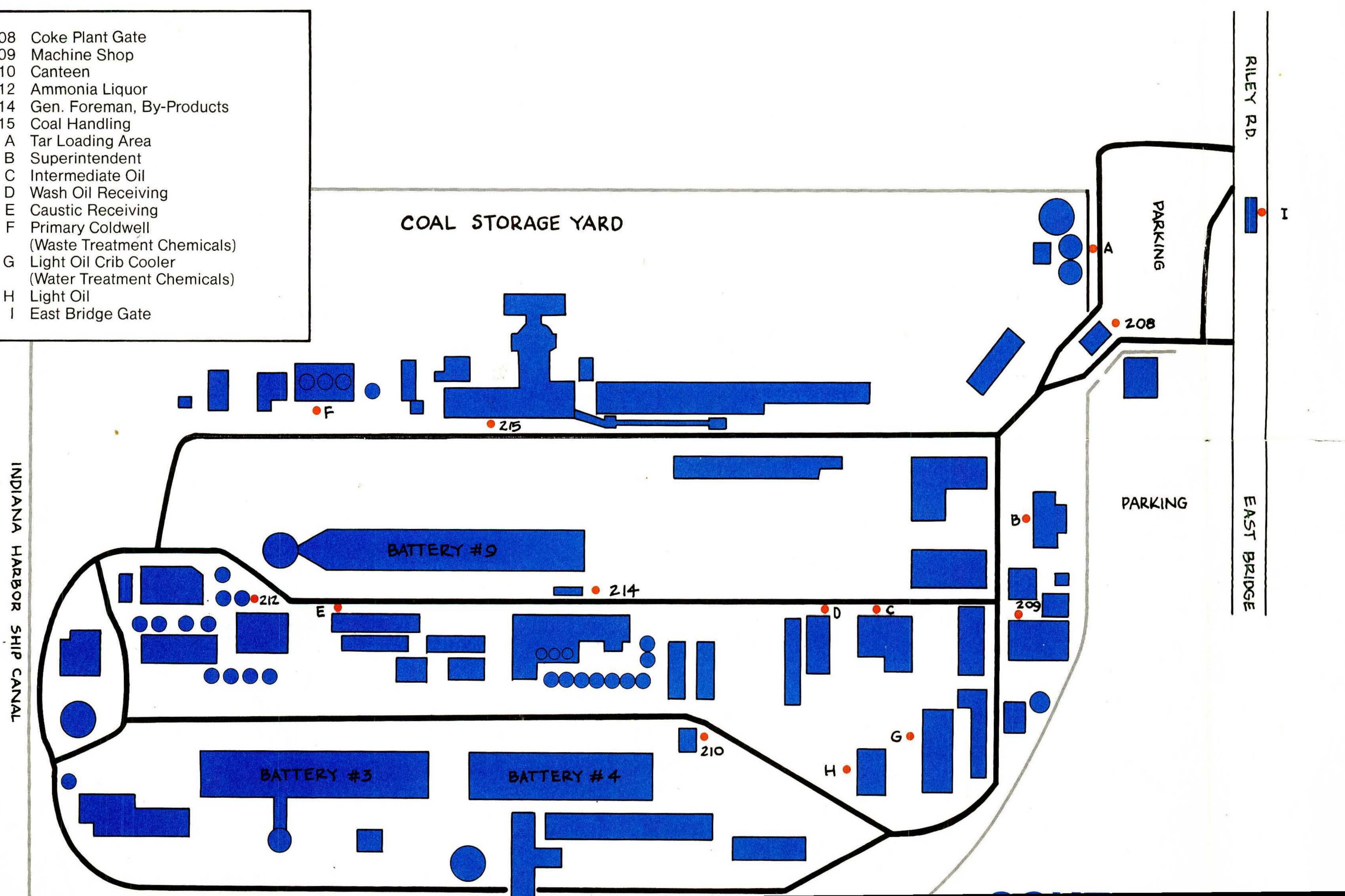
#1 TIN MILL
- 135 Finishing, Warehouse, Dock #51 (Billing Office).
- 137 Electric Shop.
- 139 Central Spares.
- 140 Pickler.
- 141 Pickler, Dock #41.
- 142 Roll Shop, Mtce., 3-Stand.
- 143 T.M. Pipe & Bridge Shop.
- 145 Dock #50.
- E Safety Department.
- F #1 and #2 Tin Mill Q.C.
- G Training Department.
- H #1 T.M. Hospital.
- I Fire Station.
- J Labor, Instrument Shop, Carpenter Shop.
- K #1 T.M. Gate, Employment.

#2 TIN MILL
- 190 Maintenance.
- 192 Billing Office.
- 194 Dock #60.
- 195 Halogen Line, Finishing.
- 197 Roll Shop, 6-Stand.
- 200 Cleaning & Annealing.
- 203 Temper Mill, Coil Prep Roll Shop.
- 204 Waste Water Plant.
- L #2 T.M. Gate.
- M Data Processing.



• NO. 1 TIN MILL • NO. 2 TIN MILL • NO. 2 COLD ROLLED SHEET MILL

- 208 Coke Plant Gate
- 209 Machine Shop
- 210 Canteen
- 212 Ammonia Liquor
- 214 Gen. Foreman, By-Products
- 215 Coal Handling
- A Tar Loading Area
- B Superintendent
- C Intermediate Oil
- D Wash Oil Receiving
- E Caustic Receiving
- F Primary Coldwell (Waste Treatment Chemicals)
- G Light Oil Crib Cooler (Water Treatment Chemicals)
- H Light Oil
- I East Bridge Gate



JL STEEL
an LTV company

INDIANA HARBOR WORKS RECEIVING TRUCK ROUTES

BASIC OXYGEN FURNACE
82 E-6 West End, Mould Yard.
83 E-6 Maintenance

BLAST FURNACE
C A-8 Blast Fces., Sinter Plt., Ore Dock, Ladle & Car Repair.

#1 BLOOMING MILL
D B-7 Superintendent

#3 COLD ROLLED SHEET MILL
101 F-3 Pickler Acid, 5-Stand Oil.
103 F-3 Annealing, Labor, Bridge Shop.
104 E-3 Temper Mill.
105 E-3 Maintenance.
106 E-3 Finishing Oil.
107 E-3 Dock #86.
108 E-3 Finishing, Dock #87.
109 D-2 Dock #88.
110 D-2 Dock #89.
114 E-2 Roll Shop, 5-Stand.
115 E-2 Pickler, Dock #85.
116 E-2 Superintendent.

CONTRACTORS
H A-2 Heckett Engineers.
L D-3 Samocki Brothers.
N E-5 Vulcan Materials.
O F-4 Industrial Disposal.

FIELD MAINTENANCE
37 B-7 Superintendent, Elect. Testing, Motor Room, Crane Rpr., Tech. Serv.
F G-3 Automatic Controls.

84" (#3) HOT STRIP
151 F-4 Warehouse, Dock #92.
154 G-4 Dock #91.
155 G-4 Finishing, Fin. Mtce., Dock #90.
160 F-2 Coil Storage.
161 F-2 Dock #93.
162 F-2 Roll Shop.
165 G-3 Hot Mill Mtce., Labor.
171 H-4 Motor Rm. (Mill)—T.M. Pipe & Bridge Shop.
187 H-4 T.M. Pipe & Bridge Shop Annex.

MOBILE EQUIPMENT
42 D-7 Garage (Vehicular).
54 A-5 Railroad Car Repair.
59 B-7 Locomotive Shop.

QUALITY CONTROL
2 A-8 (East Wall) S.P., C.P., Strip, Sheet & T.M. Chem. Labs.
91 C-2 #3 Seamless Q.C.
105 E-3 #3 CRSM Q.C.
155 G-4 84" H.S. Q.C.

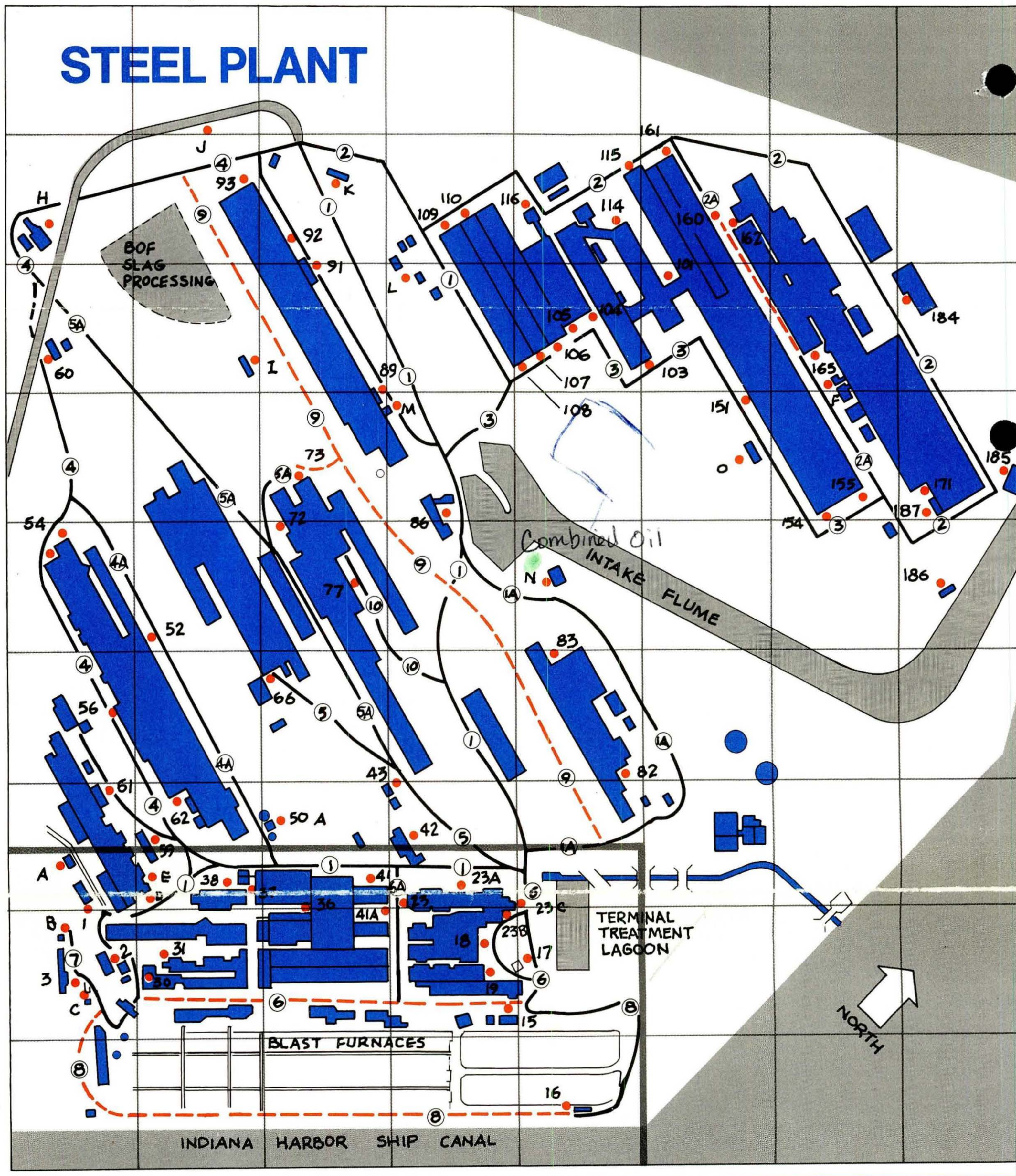
#3 SEAMLESS TUBE MILL
89 C-3 Hot Mill, Hot Mill Mtce.
91 C-2 Hot Mill, Billing Office, Finishing Maintenance.
92 C-2 Finishing.
93 B-2 Dock #10.
52 B-5 Docks #34, #35, #36 (Seamless Annex, Merchant Mill).

SHOPS DEPARTMENT
18 D-8 Welding Mach. Repair.
19 D-8 Structural Storage Dock.
23 D-7 Fab and Weld Shop.
23A D-7 Fab and Weld Shop.
23B D-7 Fabrication Job Shop.
36 C-7 Mach. Shop Annex.
37 B-7 Mach. Shop Annex.
38 B-7 Machine Shop.
41 C-7 Line Shop.
41A C-7 S.P. Pipe Shop.
56 A-6 Roll Shop Superintendent.
61 A-7 S.P. Carpenter Shop.
62 B-7 Rigger Shop.
66 C-6 Mason Department.

#2 SLABBING MILL
72 C-5 Maintenance.
73 C-4 Roll Shop.
77 C-5 Supt., #3 Slab Yard.

TRANSPORTATION AND LABOR
43 D-7 Yard Labor.
60 A-3 Transportation.

UTILITIES
B A-8 Superintendent.
15 D-8 #1 Pump House.
23C D-7 Refrigeration.
30 B-8 Boilerhouse.
31 B-8 Powerhouse.
50A C-7 Merchant Mill Fuel Oil Tanks.



1 A-7 Works Mgr. Gen Supts., Acctg., Gen. Eng., Security, Fire Prevention.
2 A-8 (West Wall) Canteen and Commissary.
16 E-9 Barge Dock.
17 E-8 Environmental Control.
54 A-5 Constr. Warehouse.
186 H-5 Constr. Engineering.
A A-7 Building Maintenance.
E B-7 Iron Foundry.
I B-3 Heckett Scale.
J B-2 West Bridge "Out Gate".
K C-2 S.P. Scale.
M D-4 S.P. Hospital.

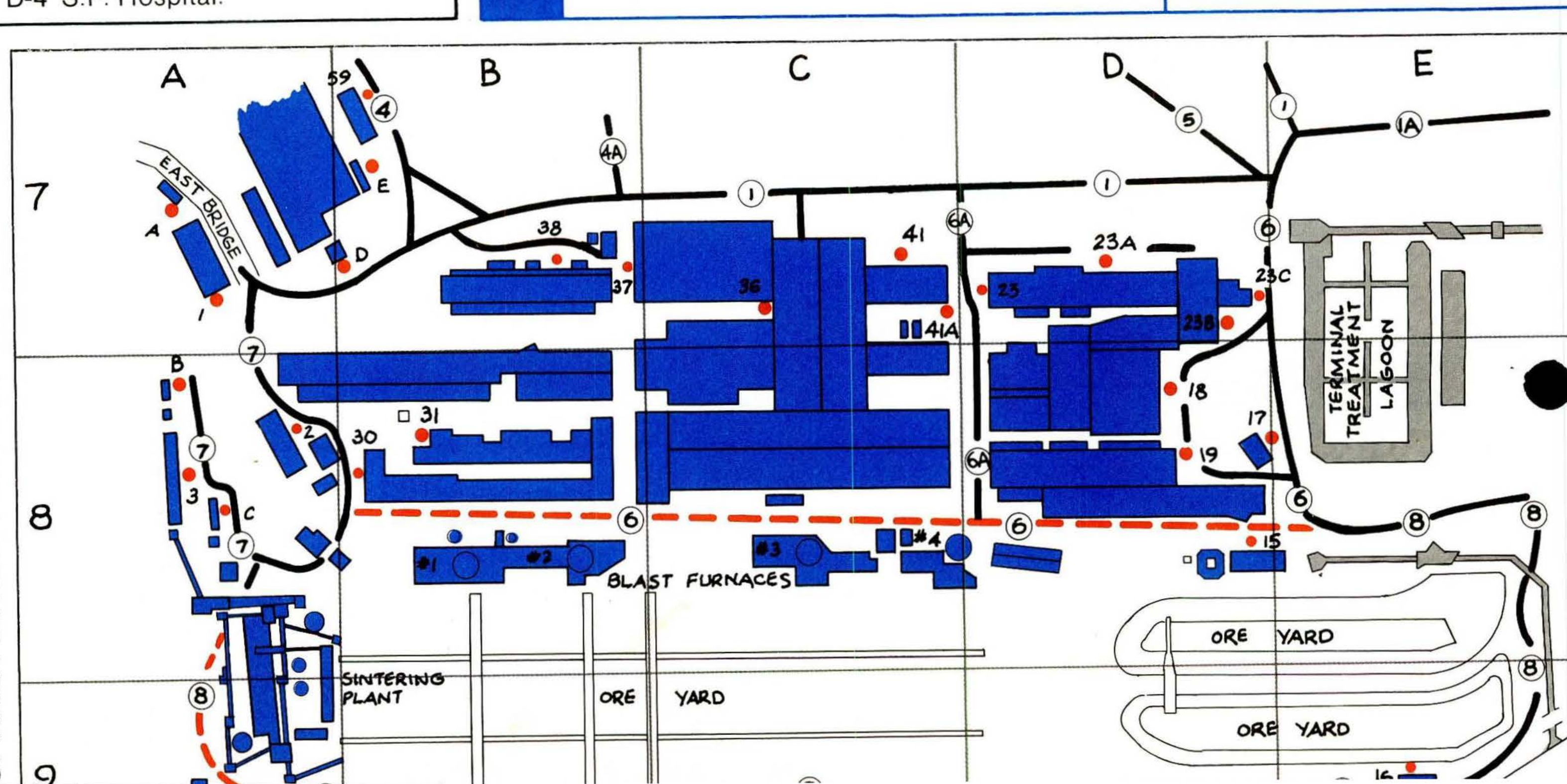
LEGEND

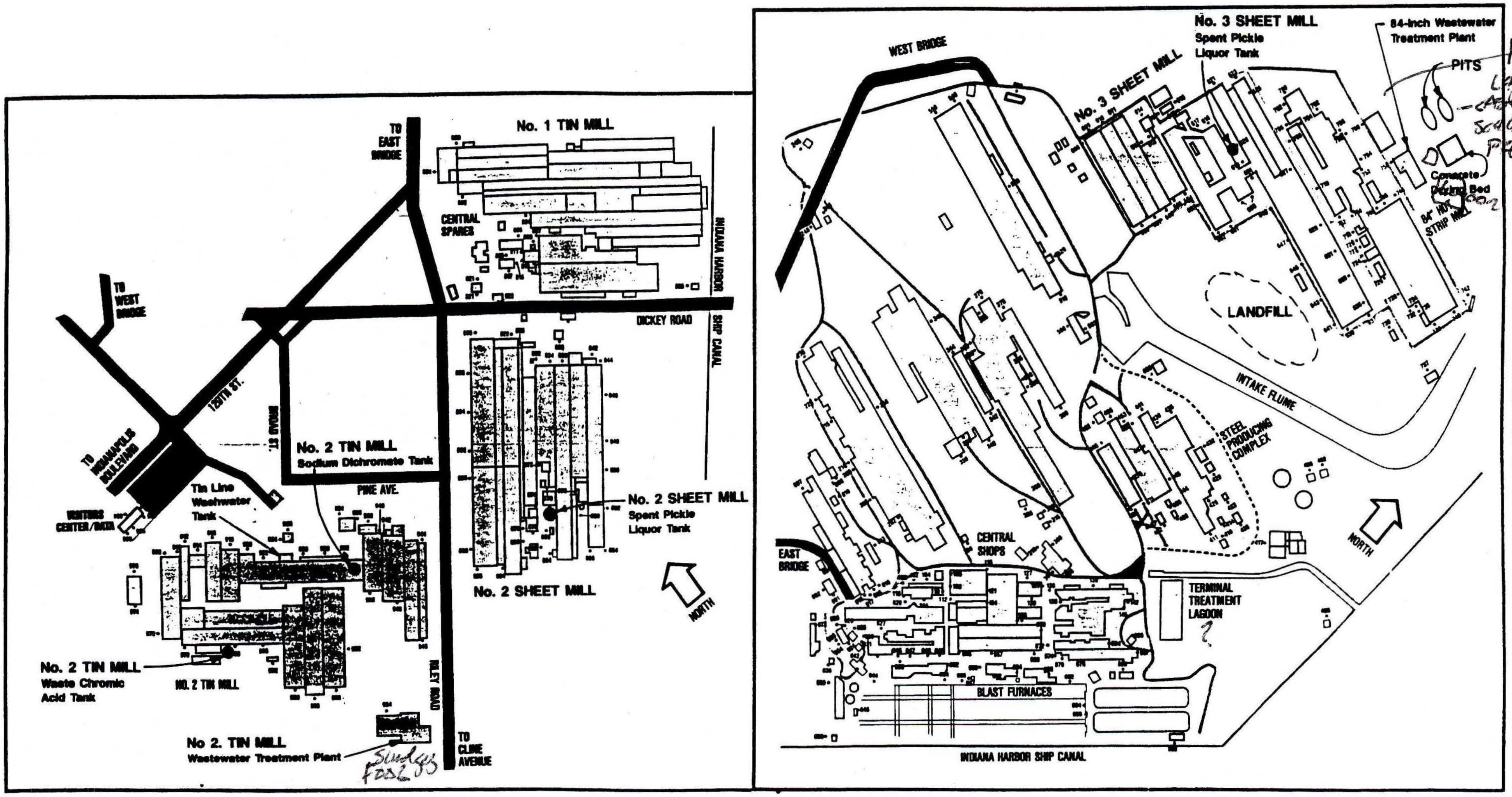
Primary delivery routes (1)
Restricted Routes (9)
(Hazardous roadways due to poor road conditions of heavy equipment traffic. Authorized vehicles only.)
Route Markers — 3 ROUTE
Station Number — 15

PLANT TRAFFIC RULES

Speed limit within plant 15 mph unless otherwise posted.
Complete stop at all stop signs.
Yield right of way to pedestrians.
Use extreme caution at all railroad crossings.
Do not pass personnel buses while loading or unloading at bus stops.

OF AREA OUTLINED WITH BOLD GREY LINE





SOUTHWEST SECTION

NORTHEAST SECTION

NOT TO SCALE

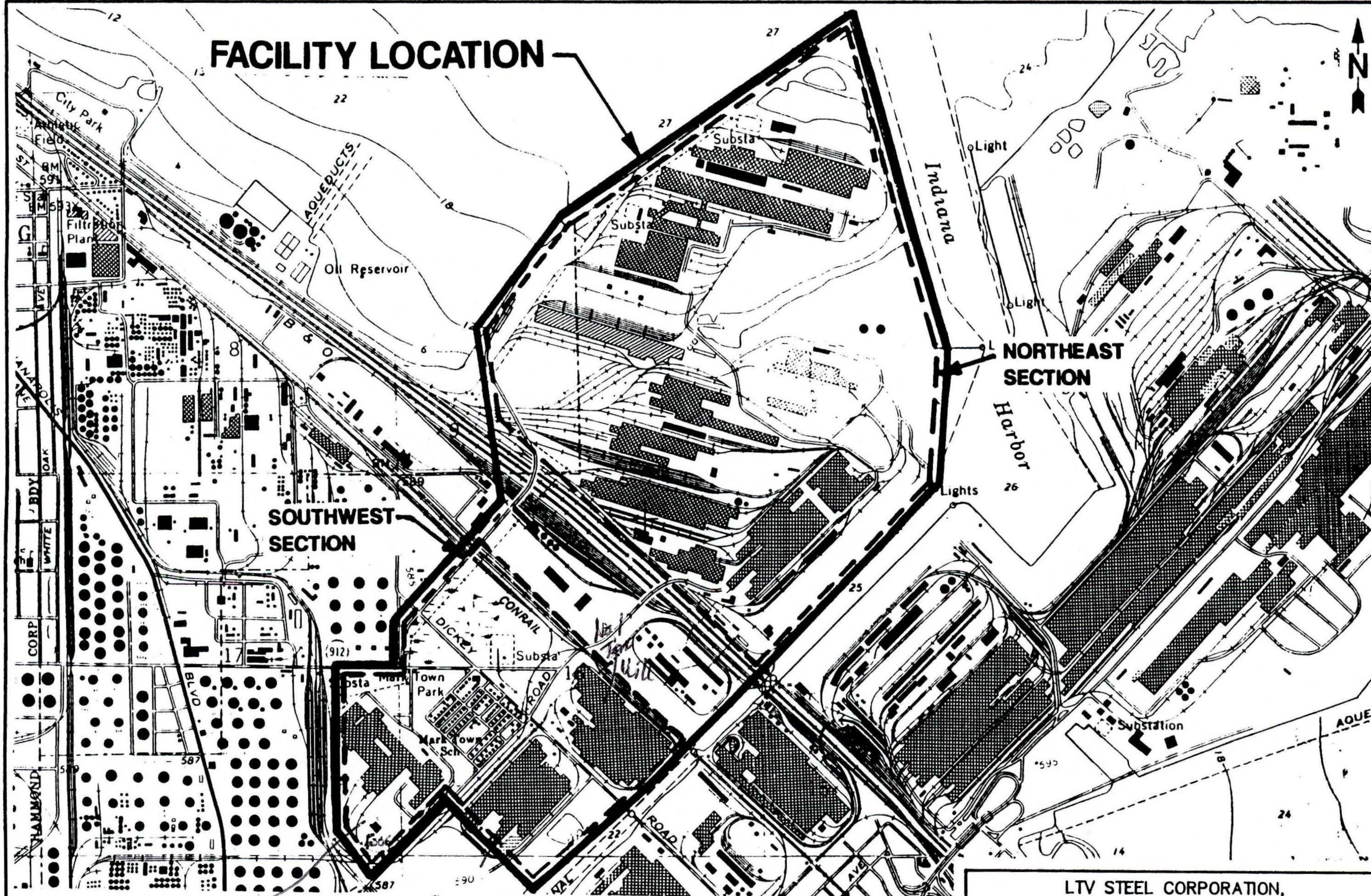
LTV STEEL CORPORATION
INDIANA HARBOR WORKS
EAST CHICAGO, INDIANA

FIGURE 2
FACILITY LAYOUT

PRC ENVIRONMENTAL MANAGEMENT, INC.

LTVSTEEL.DWG - 04/07/92 - RAO

LTVSTEEL.DWG - 4/3/92 - MLB



Doo2, Doo7
Doo8, Foo6
Foo7

No. 2 Tin Mill

Sheet Mill #2 (K062)
D002

SCALE 1: 24,000

1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

SCALE: 1" = 2,000'

SOURCE: MODIFIED FROM USGS, 1980

LTV STEEL CORPORATION,
INDIANA HARBOR WORKS
EAST CHICAGO, INDIANA

FIGURE 1

FACILITY LOCATION

PRC ENVIRONMENTAL MANAGEMENT, INC.

Slag Filled →

Indiana Harbor Works

LTV Steel's Indiana Harbor Works, located in East Chicago, Ind., is a fully integrated steelmaking and finishing facility. It has three blast furnaces, a modern two-vessel basic oxygen furnace, a continuous slab casting complex, an 84" hot strip mill, two cold reduction sheet mills, two galvanizing lines, one being a convertible coating line capable of producing either galvanize or *GALVALUME™ sheet steel and a tin mill.

As evidenced by its production units, Indiana Harbor is a major producer of flat rolled sheet products serving the automotive, agriculture, appliance, food processing and beverage markets. Other major markets are transportation equipment, commercial building materials, farming and construction equipment and the steel service center industry.

The plant covers more than 1,200 acres on the southern shore of Lake Michigan, and employs approximately 4,700 men and women. Its steelmaking capacity exceeds 3.3 million tons annually.

Indiana Harbor Operations

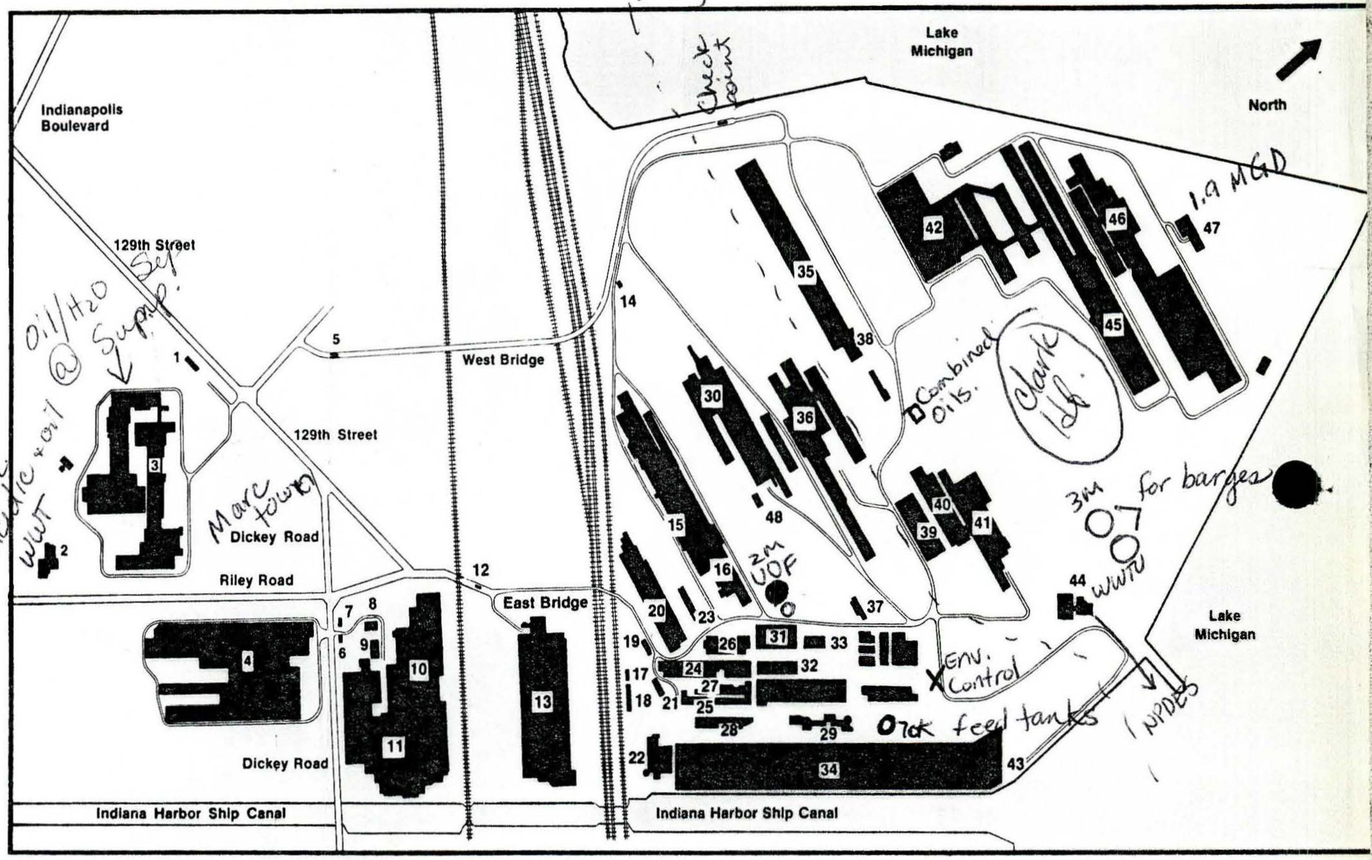
Iron Foundry

The iron foundry supplies ingot molds and stools, cast from molten iron, for use in the steelmaking process at other LTV Steel plants. Opened in 1967, the foundry was expanded in 1982 and now can produce 500 tons of molds and stools per day. The ingot molds come in various sizes and shapes according to the end use of the product.

There are three operable blast furnaces at the Indiana Harbor Works which provide molten iron for its two basic oxygen furnaces, where the iron is further refined into steel.

The No. 1 and No. 3 furnaces are currently in operation. The No. 3 furnace has outperformed all other single-taphole furnaces in North America, with production of more than 4,500 tons of iron per day. The No. 4 blast furnace, which has a daily capacity of 4,750 tons a day, is being renovated and will resume operations by July 1987.

*GALVALUME is a registered trademark of BIEC International, Inc.



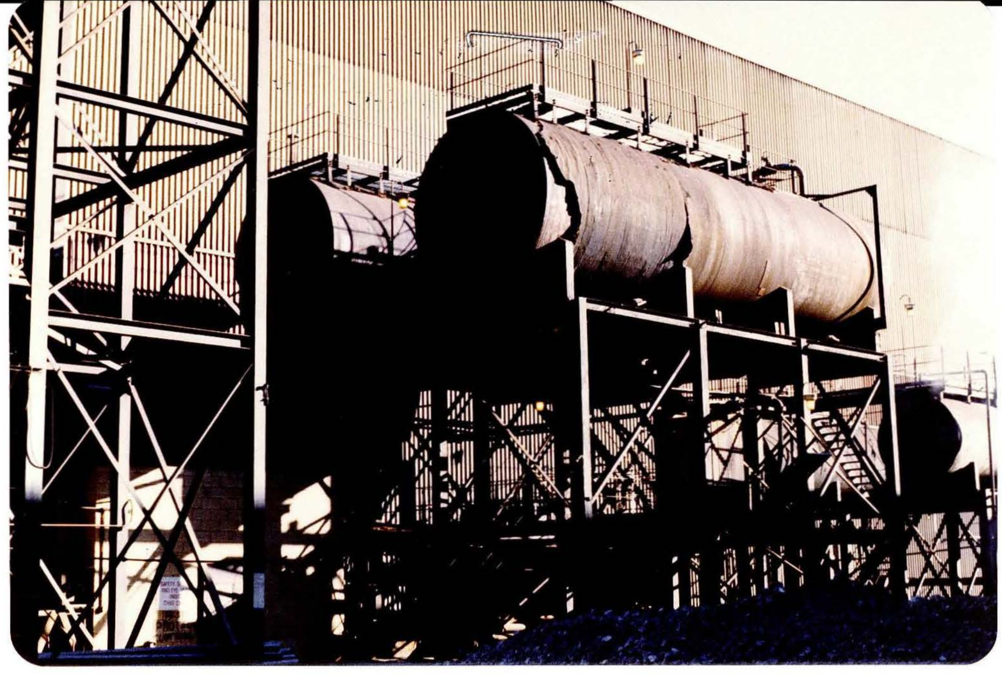
Indiana Harbor Works

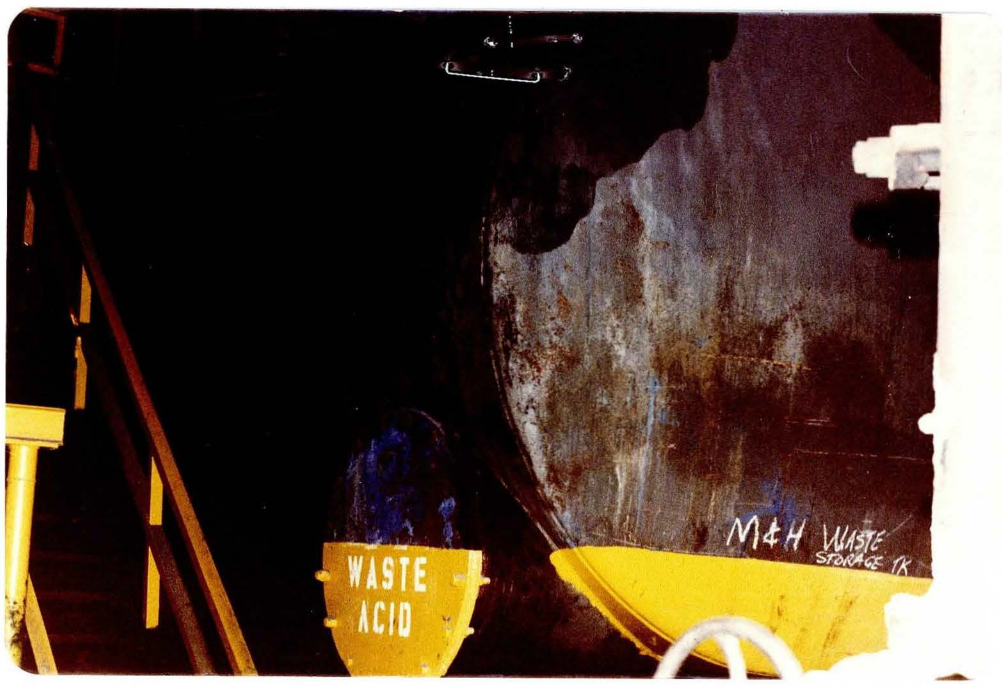
1. Visitor Reception
2. Central Treatment Plant
3. Tin Mill
4. No. 2 Sheet Mill
5. West Bridge Entrance
6. Employment/Insurance Office
7. Safety Office
8. Tin Mill Hospital
9. Training Department
10. Central Spares
11. Tin Mill Warehouse
12. East Bridge Entrance
13. Coke and By-Products Plant (operation ceased)
14. Transportation Department
15. Roll Shop Office
16. Garage
17. Utilities Department
18. SP Quality Control
19. Main Office Building
20. Iron Foundry
21. Commissary Building
22. Sinter Plant
23. Locomotive Shop
24. Parking
25. Boiler House
26. Central Shops
27. Power House
28. Blast Furnace No. 1
29. Blast Furnaces Nos. 3 and 4
30. No. 2 Open Hearth (operation ceased)
31. Pipe Shop
32. Field Maintenance
33. Fab Shops
34. Ore Dock-Raw Materials
35. Seamless Pipe Mill (operation ceased)
36. Slabbing Mill (operation ceased)
37. Motor Pool and Fire Dept.
38. Steel Plant Hospital
39. BOF Mold Prep. Bldg.
40. Continuous Slab Casting Complex
41. Basic Oxygen Furnace (BOF)
42. No. 3 Sheet Mill
43. Barge Shipping Dock
44. Steel Plant Filtration Station
45. 84" Hot Strip Finishing Department
46. 84" Hot Strip Mill
47. 84" Hot Strip Filtration Plant
48. Mason Department

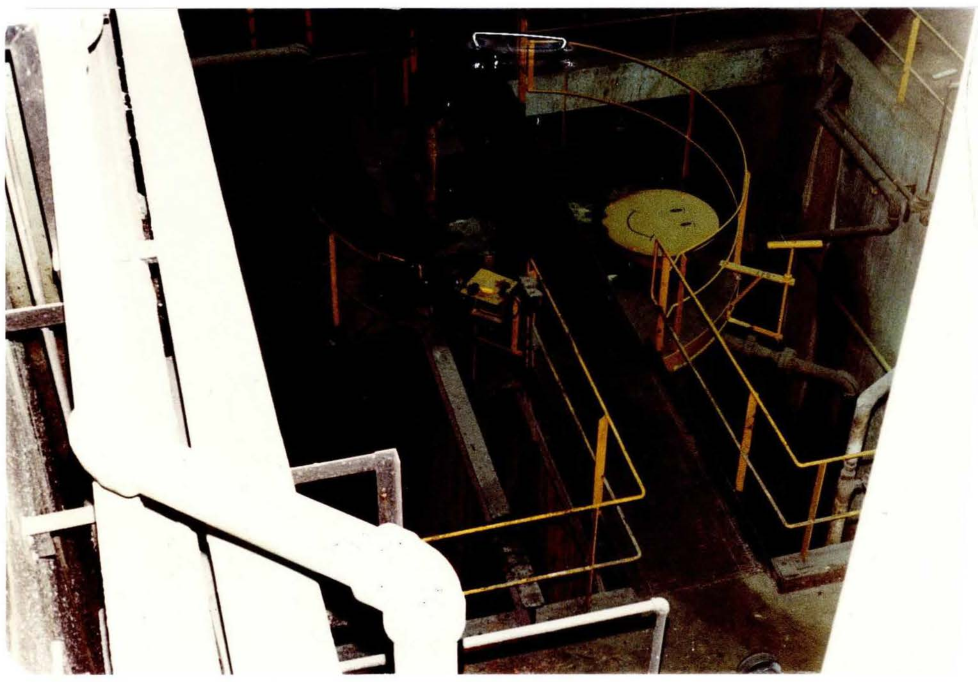
Steel Producing

Steel is produced from scrap steel and blast furnace hot metal in two 285-ton vessels in the modern basic oxygen furnace (BOF) shop. The furnace uses one ton of oxygen per minute during the 18 minutes oxygen is blown. A 285-ton heat is produced in approximately 30 minutes. Then the molten steel is taken by ladle to LTV Steel's new continuous slab casting complex to be formed directly into slabs.

The continuous casting facility, which began operations in October 1983, is the most technically advanced in the Western Hemisphere with a production rating of 280,000 tons per month. The facility has two casting machines - one casting two narrow slabs between 28 and 42 inches wide and the other casting one slab 40 to 78 inches wide.




WASTE
ACID
M&H WASTE
STORAGE TK



"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

HORIZONTAL LINE

All-Weather Notebook
No. 391

LTV Steel
February 23, 00'

4 5/8" x 7" - 48 Numbered Pages

LTV Steel
2/23/00

2/23/00
arrived at site 1000 met
with IDEM personnel:

Mike Sickels
Ruth Williams
Chris Myer

arranged SWMUs on site map in order to be prepared for meeting & present areas to view for potential sampling).
1045 drove into site to meet with LTV personnel

Mike Thomas - LTV
Alan Cross - LTV

- began meeting to discuss the locations with LTV. (will take pictures & provide LTV with pictures).

- Wayne Gould - LTV → Assets Management Section
→ in charge of areas that have been demolished

DJC 2/23/00

It appears that a portion of the area has been demolished in the past which contained areas of potential sampling. Unable to identify areas now since all buildings have been demolished. The Assets Mgmt. Branch could potentially locate these areas of land.

- Going on site tour 1135.
Former Cadense Tank is first stop.
(SWMU ~~10~~ 35 DJC area) → FKA 312

- fuel oil # 6 tank.

R1P1 2/23/00
1148 SE

View of the fuel oil #6 tank. Note water and sheen floating on water. Picture from ontop of berm.

DJC 2/23/00

RIP2 2/23/00
1150 SE

Photo of the #6 fuel oil tank from bottom of berm looking up.

water was all around the bottom of the tank. Sheen floating on top.

- Terminal Lagoon SWMU 10

RIP3 + RIP4 2/23/00
1156 N-NE

view of the Terminal Lagoon (SWMU 10)

-there is a scale pit ahead of the Terminal Lagoon which has the major water flow from the steel plant + then processed through this system. con't

DSC 2/23/00

In photo RIP3 - RIP4 - note the Basic Oxygen Furnace (BOF) dust.

~~SMU~~ DSC 2/23

SWMU 11 - LMF Baghouse

RIP5 - RIP6 2/23/00
1206 SE

view of the LMF Baghouse and the roll off containing hazardous waste cadmium.

Note on photo RIP5 the fill start date on the haz. waste roll off is 2-18-00.

Concrete underneath roll off box - does not appear to be any concrete or containment under baghouse.

DSC 2/23/00

RIP7 2/23/00
1207 SE

view of baghouse + containment for waste cadmium.

Swmu 15
Basic Oxygen Furnace that generates BOF dust.

generated here and then trucked over to the pile for ~~baghou~~ DJC BOF dust (Photo RIP3 - RIP4)

no photos taken at this SWMU.

DJC 2/23/00

~~Landfill~~ DJC 2/23

Clark Materials Landfill
(- contractor that ran landfill was called Clark)

RIP8 - RIP10 2/23/00
1218 N - NE

~~view~~ DJC panoramic view of the Clark landfill.

Photo RIP10 - note drums + scrap materials in the foreground.

Swmu 7 - "The Hill" - no longer in operation

The Hill was used for "steel mill waste" - no definite knowledge of what was disposed of in this Swmu.

RIP11 - RIP13 2/23/00
1240 N-NE

view of "the Hill" - note the scrub grass on "the Hill."

DJC 2/23/00

Note in RIP11 the wastewater running to the wastewater treatment plant.

SWMU 27 - Concrete Sludge Drying Beds

- was concrete walls here - gone now - do not know if there was a floor in these drying beds. no longer used as drying beds. Pile is now debris ontop of where drying beds were located.

RIP14 2/23/00
1258 SE

view of former concrete sludge drying beds (SWMU 27). The concrete wall no longer exists and debris now covered on top of drying beds.

DSC
2/23/00

SWMU 26 was in an excavated area and is now gone.

SWMU 23 (filter backwash pile) was located in the area of SWMU 27. The pile no longer exists.

RIP15 2/23/00
1306 SW

view of SWMU 23's former location near blue pick up truck.

Note: a concrete lined pit now exists where SWMU 23 was located

No. 3 Sheet Mill spent Pickle Liquor Tank (SWMU 28 and SWMU 29)

DSC
2/23/00

R1P16 2/23/00
1315 N

view of the spent pickle liquor tanks (swmu 28 + 29). Note the staining on the concrete berm which may possibly be considered secondary containment.

P1P17 2/23/00
1316 NE

view of the ferrous chloride (waste tanks + the staining on the concrete berm. These tanks are labeled as hazardous.

According to LTV Steel (Mike Thomas) Swmu 73 never existed. It was stated that ~~water~~ DJC the quenching area never was staged and never happened.

DJC 2/23/00

swmu 65 - Coke Plant Decanter Site

-no longer in existance. LTV does not manufacture coke any longer. It is all shipped in now.

R1P18 2/23/00
1349 SW

View of the former swmu 65 — Area is now scrub brush + all coke plant buildings (decanter) are removed from this area.

Swmu 50 → F007 waste
Swmu 45 → D007 waste

Swmu 50 is a new structure now → replacing old swmu 50.

→ ALL smwu 50s on this pg are 44 swmu

DJC 2/23/00

RIP19 2/23/00
1410 S

#2 Waste Chromic Acid Tank Area (former SWMU 50). Now concrete catch basin in area.

→ picture is actually SWMU 44.

SWMU 45 - waste sodium dichromate loading area

RIP20 2/23/00
1420 S

View of the waste sodium dichromate loading area (SWMU 45). note the blue staining in basin and building bottom. Also note the blue around the outside of basin.

DJC 2/23/00

SWMU 50 (waste chromic acid tanks)

RIP21 2/23/00
1435 E

View of the chromic acid (SWMU50) tank on 2nd level. Note the rust on the building and the absence of a tank on the top level - present in RFA -

RIP22 2/23/00
1436 NE

View of truck wash station at SWMU 50. Note the new concrete and gravel in area.

left site at 1500.

DJC 2/23/00

"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

HORIZONTAL LINE

All-Weather Notebook
No. 391

LTV: VSI
2-23-00

4 5/8" x 7" - 48 Numbered Pages

Arrived on Site 1000 on 2-23-00
Weather: Sunny: 50°F wind 10-20 mph

Met @ guard shack: received card for car, proceeded to List & ID SWMUs/AOC to be visited on site Map w/ IDEM & EPA

Met w/ EPA, IDEM & LTV personell for site intro meeting

Some of the AOC/SWMUs ID by EPA/IDEM were said to be removed by LTV. These areas now flattened w/o foundations. Said to contain only scrub trees & weeds.

Coking operations @ LTV said to have ceased ~10 years ago. Area of coke operations ID'd on Demaree's Map (copies of site map aerial photograph & list of participants were handed out).

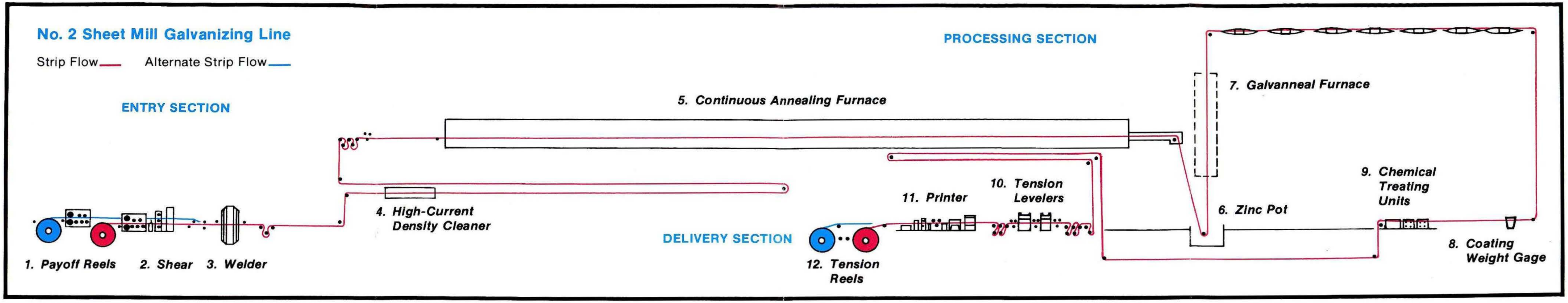
Toured facility w/ IDEM, EPA & LTV personnel.

Photographed SWMUs and AOC described in morning meeting.

Photo log is kept by Demaree Collier & is located in her notebook

Photographer for each picture was Terry Ueckert.

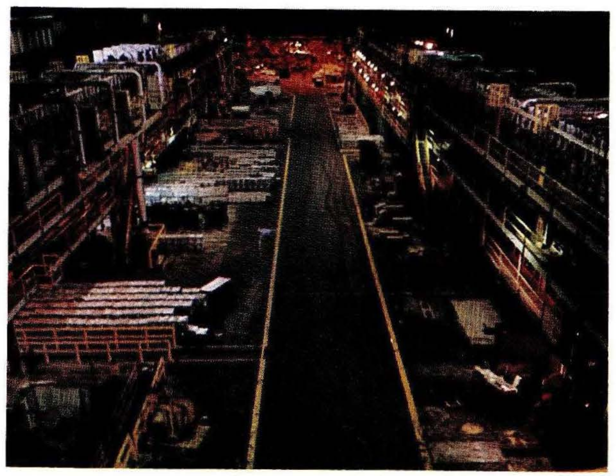
Left Site @ 1500



The above diagram illustrates No. 2 sheet mill's galvanizing process.

sent to the tin mill where it will be further processed according to customer orders.

The line operates at speeds up to 600 feet per minute. The average size of the strip entering the pickler is .084 inch thick by 33 inches wide.



Much of the steel coated with zinc or aluminum and zinc at the No. 2 sheet mill is used to make farm and industrial buildings where a high degree of corrosion resistance is required.

Galvanizing Line

The mill's galvanizing line is a huge, intricate facility which coats steel with zinc, providing an economical and effective protection against corrosion. Once coated, galvanized steel is highly versatile and widely used for many applications, including automobiles, pre-fabricated buildings, air conditioners, culverts and garbage cans.

The galvanizing line applies zinc coating to steel coils in a continuous operation. The coating process begins when the steel coils, received from the Harbor's No. 3 sheet mill, are fed from the uncoilers into the line. There, the front end of one is welded to the trailing end of the coil ahead. Following the welding, the strip travels through a pre-heat furnace, which heats the strip to pre-determined temperatures to rid the surface of any oil or oxide.

It then passes through a protective atmosphere of nitrogen and hydrogen inside the reducing furnace to avoid contamination of the surface before the strip enters the molten zinc.

Annealing of the strip takes place in the furnace giving it the appropriate softness to make it more workable. Before exiting, the strip is cooled to about the temperature of the molten zinc.

After it is dipped into the zinc pot, a jet of air is blown across the surface to remove any excess zinc and to control the coating thickness. The galvanized steel continues through an 85-foot-high cooling tower where the coating solidifies.

Extending over 800 feet, the line produces a wide range of products varying in strength, coating weight, hardness and size. The thickness ranges from .014 to .165 inch, and the width varies from 24 to 72 inches.

In terms of finishes, the line can supply galvanized steel with regular spangle, extra smooth with minimum spangle or alloyed coating. Spangle is the flowery appearance created when the top layer of zinc crystallizes.

The galvanized steel is sheared and rewound into a coil. The coils may be shipped directly to the customer or sheared into sheets before shipping.

GALVALUME™

In 1981, the No. 1 galvanizing line was converted to produce either galvanize or GALVALUME coating. GALVALUME is an aluminum-zinc alloy coated sheet steel which displays exceptional corrosion resistant properties in a variety of atmospheres. It is designed for use in the metal building, appliance and automotive markets.

The move to enter the aluminum-zinc coated sheet market was made as the result of the increasing demand for the product, particularly by the manufacturers of metal buildings.

The coating process for GALVALUME virtually is the same as galvanizing, with the exception of the high-temperatures needed to melt the aluminum-zinc mixture.

Annealing

Through a heating process, called annealing, the cold reduced and galvanized steel is softened, made more workable and relieved of its stresses.

The coils are stacked on annealing furnace bases with convector plates separating each coil. Covers are lifted into place over the stacked coils.

Then the furnace itself is placed into position and heated to as much as 1,360 degrees Fahrenheit for a pre-determined time ranging from eight to 30 hours. During annealing, oxidation of the steel surface is prevented and its bright surface is maintained by careful monitoring of the atmosphere inside the cover.

The No. 2 sheet mill annealing department contains 15 furnaces capable of servicing a total of 60 stacks of steel coils.

™A trademark of BIEC International, Inc.

Welcome To The No. 2 Sheet Mill Of LTV Steel's Indiana Harbor Works

The No. 2 sheet mill contains three operations which prepare and process steel destined for such uses as the underbody of a car, a storage building, a garbage can, a food can or a paint can.

Built in 1952, the mill has been expanded and rehabilitated to include new processing units which increased the company's product lines. At present, the mill has facilities for "pickling" or cleaning steel strip bound for further processing at the Harbor's tin mill, and for coating steel with either zinc or aluminum-zinc to protect it against corrosion.

Operations

Pickle Line

A "hot band" is the starting raw material for the No. 2 sheet mill's pickle line. A hot band is produced by rolling a slab of steel, heated to 2,400 degrees Fahrenheit, into a long, thin "band," which is wound into a coil. The hot bands are produced at Indiana Harbor's 84" hot strip mill and shipped to the No. 2 sheet mill for pickling.

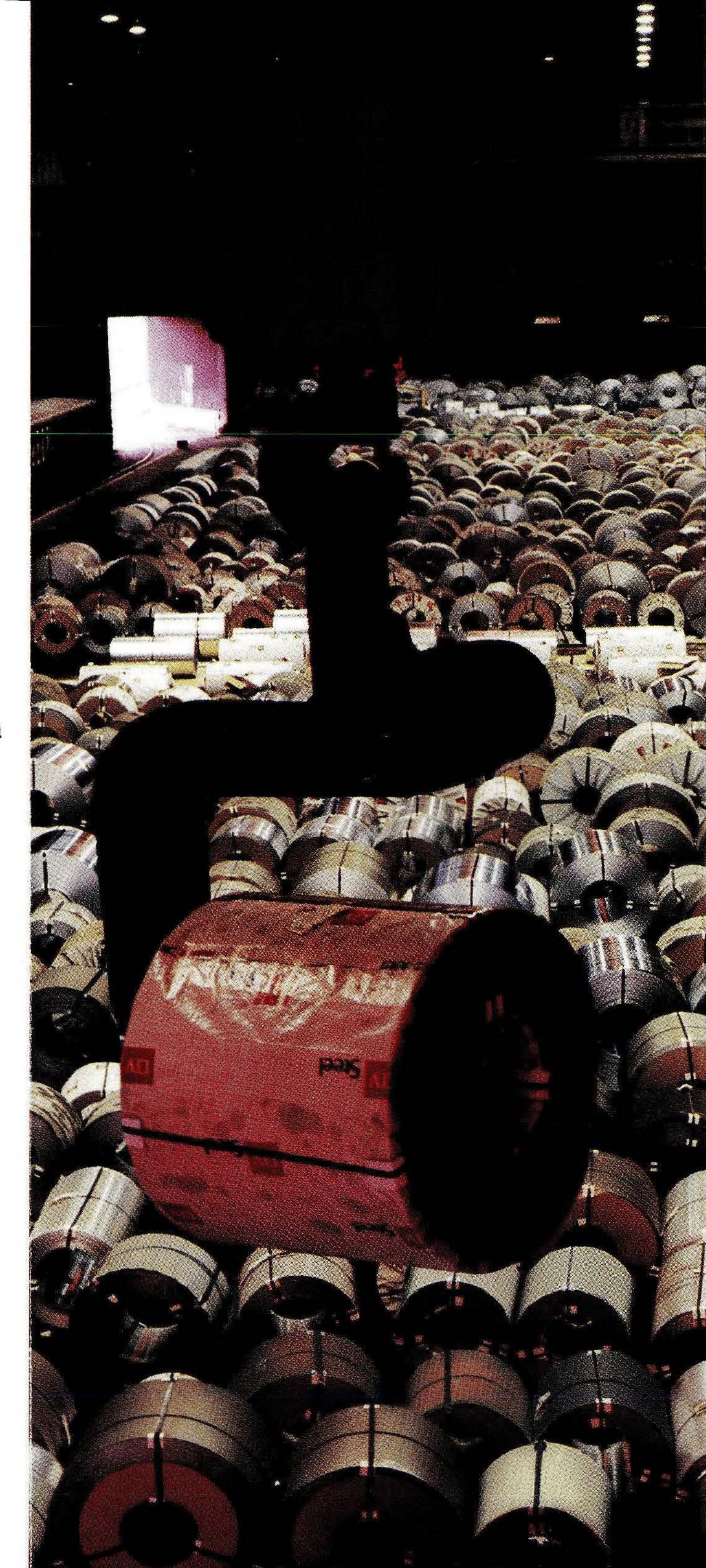
After cooling, the hot rolled band is uncoiled and "pickled" or cleaned to remove iron oxide. The iron oxide, known as "scale," forms on the surface of the steel during the hot rolling process.

The coil enters the pickling line and passes through a butt welder, which welds the coil end to end with the coil ahead. This provides a continuous ribbon of steel for pickling.

The removal of the scale is accomplished by running the strip first between processor rolls, which crack the oxide layer. Then the strip is immersed in four 16,000-gallon tanks filled with hot sulfuric acid and rinsed with water to remove the scale. The pickled strip then is dried, trimmed, oiled, recoiled and

Front Cover: Galvanized steel glimmers as it emerges from a container of zinc and travels up an 85-foot-high tower where the coating dries.

Right: Coils are stored in the mill's warehouse until they are shipped to customers who use galvanized steel in applications for which corrosion resistance is paramount.



The LTV Story

LTV Steel is a fully integrated steel company with facilities for producing a diversified line of carbon, alloy and stainless steel products.

The company is the nation's second-largest steel manufacturer, employing 35,000 people. It has annual sales in excess of $5 billion and annual shipments of more than 10 million tons.

Indiana Harbor Works produces flat rolled steel destined for use in automotive, appliance, agriculture, packaging, building and electrical industries. The company operates flat rolled steel plants and facilities in Aliquippa, Pennsylvania; Cleveland and Warren, Ohio; and Hennepin, Illinois. Bar operations are located in Canton and Massillon, Ohio; and Chicago, Illinois. Several cold finished bar plants are located across the country.

LTV Steel Tubular Company has operations in Ohio, Tennessee, Georgia and New York. The headquarters for LTV Steel is in Cleveland, Ohio.

LTV Steel

Indiana Harbor Works
3001 Dickey Road
East Chicago, IN 46312

9/87

LTV Steel

no. 2 sheet mill

INDIANA HARBOR WORKS

20 minutes, causing a chemical reaction. The reaction causes a rapid heating that melts the scrap and brings the mixture to the proper refining temperature.

During this "blow" period, burned lime and other fluxing agents are added to form slag and remove impurities.

Once the proper temperature (more than 2,900 degrees Fahrenheit) and chemical composition have been reached, the furnace is tilted again and the steel is tapped or poured into a brick-lined transfer ladle with a sliding gate at the bottom.

Continuous Casting

The ladle is transported on special transfer cars to the adjacent continuous casting complex. The first stop is the argon stirring facility where argon, a nonreactive gas, is bubbled through the steel. This helps to bring impurities to the surface as well as assure uniform temperature. Aluminum and other alloys may be added as well to bring the composition of the steel to the customer's exact specifications.

Following this bubbling process, a crane lifts the ladle of steel to the ladle turret at the top of one of the continuous casting machines. The turret rotates the ladle into the pouring position. Each of the two turrets (one for each machine) at Indiana Harbor Works can hold two ladles, so that heats may be poured one after the other without halting the operation.

A ceramic tube called a ladle shroud is attached to the ladle slide gate nozzle to prevent oxidation of the steel when the gate is opened. The steel then flows into a refractory-lined box called the tundish.

The tundish serves several purposes. Any nonmetallic impurities remaining can float to the surface, ladle changes can be made without interrupting the cast and the flow of steel into the mold can be controlled.

11. Casting speeds up to 71 inches a minute are among the fastest in the world.

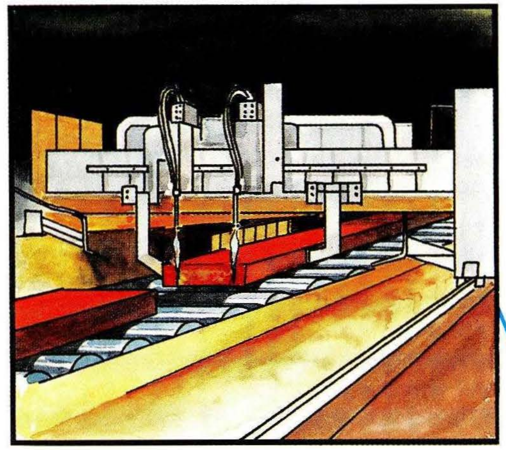
The steel flows from the tundish into the mold through another sliding gate. The mold is made of thick copper plates which are internally water-cooled, causing a thin skin to form on the outside of the liquid metal.

Huge quantities of water — between 2,000 and 2,500 gallons per minute — are used in the mold. By the time the steel leaves the mold, the skin of hardened metal has thickened to between ¼ to ¾ of an inch.

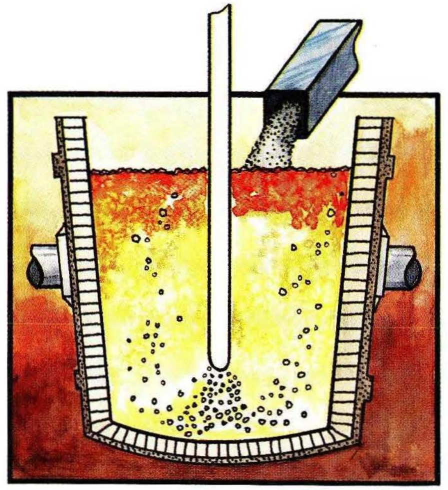
The steel continues to solidify as it passes through the water spray cooling system of the continuous caster until it is solid throughout. The steel is held in place by grids and rolls which support and guide the strand.

The strand is cast into a 40-foot radius prior to unbending. Once it is horizontal and straightened, the slab is cut into lengths by a torch-cutting machine.

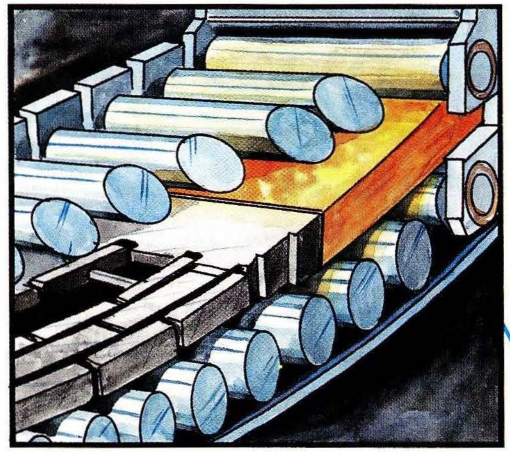
Each length is marked with an identification number. Then the slabs are shipped to the hot strip mill to be rolled into thinner strips of steel in preparation for finishing.



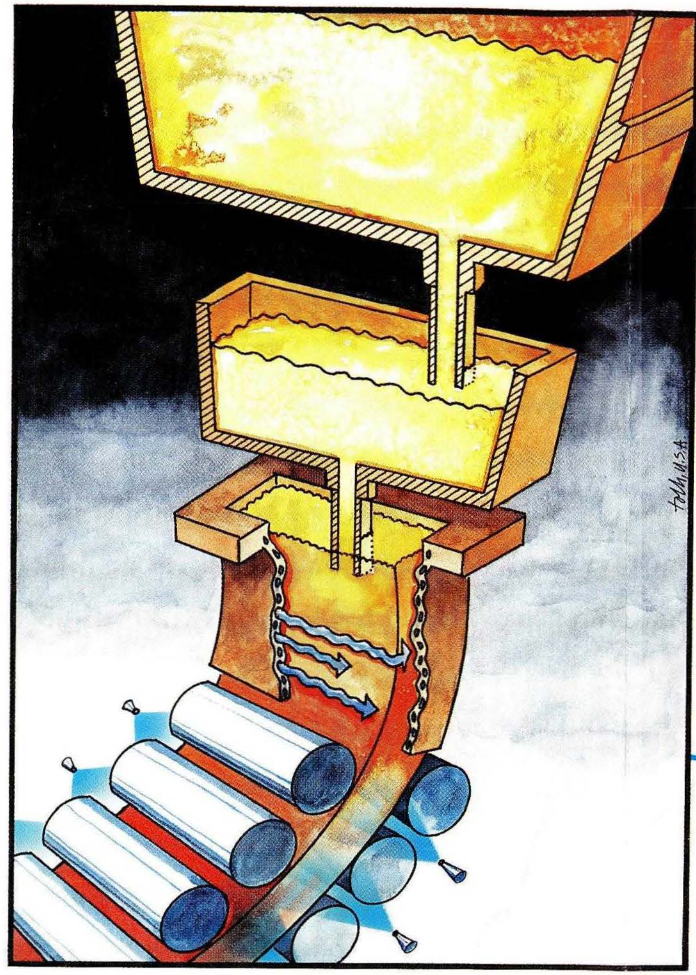
10. After the slab is straightened, it is cut into lengths by an acetylene torch-cutting machine and marked with an identification number.



4. Argon gas is bubbled through the steel to help float impurities and assure uniform temperature. Alloys are added according to the type of steel desired.



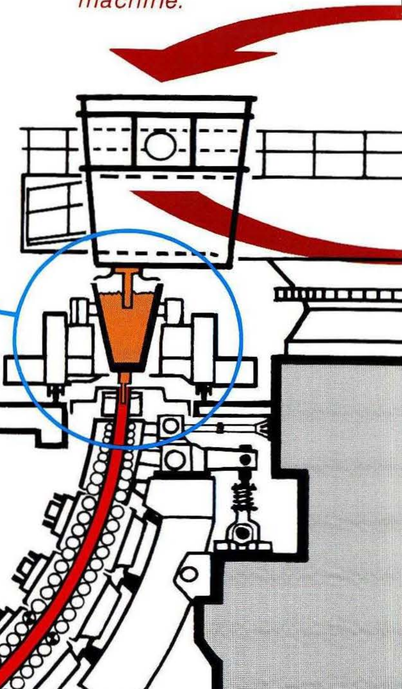
9. The semi-solid slab of steel is guided through the rollers by a special pre-made hinged slab known as a dummy bar. The roller system contains motor-driven rolls located at strategic points to pull the cast slab through the line.

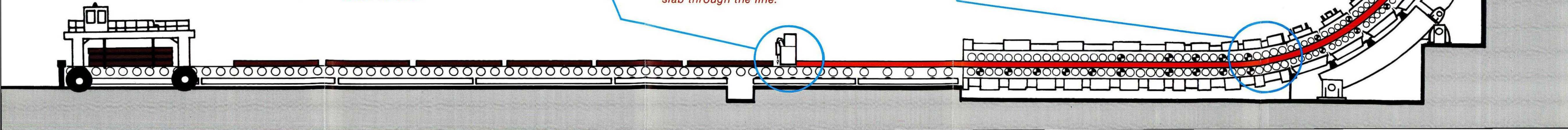


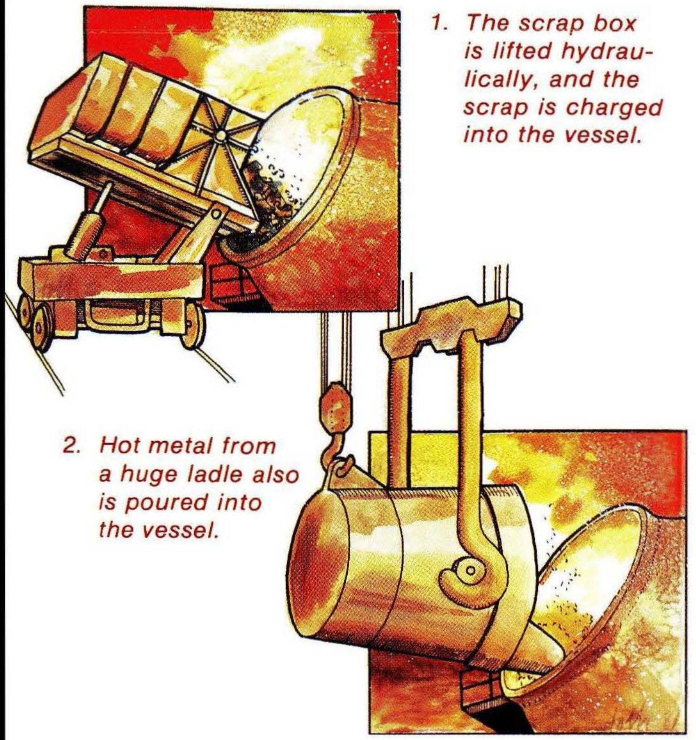
8. Steel flows from the bottom of the ladle into a reservoir called a tundish and from there into the mold where it begins solidifying. The copper mold is cooled internally by water, causing a thin skin to form on the outside of the liquid metal. As the steel descends, water sprays further cool the steel until it is solid throughout.

5. A 4
the
turr
ma

7. LTV Steel's Indiana Harbor
Works has two single-stran
casting machines, each wit
own ladle turret, tundish ar
mold. The molds are adjusta
and one is divided so two
different slabs can be cast
simultaneously by the same
machine.







1. *The scrap box is lifted hydraulically, and the scrap is charged into the vessel.*

2. *Hot metal from a huge ladle also is poured into the vessel.*

The continuous casting facility at the Indiana Harbor Works is one of the most technically advanced in the Western Hemisphere, making it possible for LTV Steel to compete with any steel producer in the world today. It has produced more than 280,000 tons per month — the highest production rate in North or South America.

The facility has two casting machines — one with the capability of casting two narrow slabs between 28 and 42 inches wide. Both are capable of casting a single slab 40 to 78 inches wide.

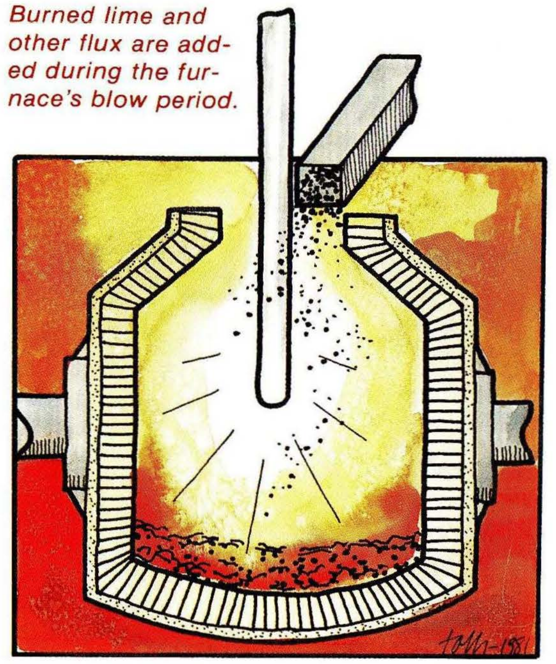
Operations

Preparation

First, a computer calculates the appropriate amount of steel scrap, blast furnace iron and burned lime (flux) necessary to make a heat. After the calculation is completed, the specified amount of iron is poured from the blast furnace ladles into the BOF hot metal ladle.

Sulfur is then removed from the hot metal at the BOF's new desulfurization facility, which consists of two treatment stations. This element impedes steel's ability to be welded and formed. A lance lowered to the bottom of the ladle injects a chemical mixture which acts to remove the sulfur. After a six-minute

3. *Burned lime and other flux are added during the furnace's blow period.*



treatment, a sample hoist extracts some of the hot metal for testing. Test results are returned in about four minutes. In that time a nearby skimming arm removes the slag and impurities floating on top of the hot metal. An automatic nitrogen bubbler makes the job easier and more thorough by bringing the slag to the ladle's lip. If tests show the necessary amount of sulfur has been removed, the hot metal is ready to be poured into the BOF vessel.

While the hot metal is being prepared for steelmaking, the calculated amount of scrap is loaded into a 3,000 cubic-foot box-like container, known as a scrap box, in another area of the department.

Steelmaking

The BOF vessel is tilted to receive the steel scrap and molten metal. The scrap box, loaded with approximately 100 tons of carefully graded steel scrap, is tilted hydraulically by a charging machine and dumped into the vessel.

Next approximately 225 tons of molten iron from LTV Steel's blast furnaces are added by an overhead crane capable of lifting 350 tons.

The BOF is turned upright and an 80-foot water-cooled oxygen lance is lowered through the opening. A high-pressure stream of almost pure oxygen is blown through the lance into the furnace for about

The LTV Story

LTV Steel is a fully integrated steel company with facilities for producing a diversified line of carbon, alloy and stainless steel products.

The company is the nation's second-largest steel manufacturer, employing 35,000 people. It has annual sales in excess of $5 billion and annual shipments of more than 10 million tons.

Indiana Harbor Works produces flat rolled steel destined for use in automotive, appliance, agriculture, packaging, building and electrical industries. The company operates flat rolled steel plants and facilities in Aliquippa, Pennsylvania; Cleveland and Warren, Ohio; and Hennepin, Illinois. Bar operations are located in Canton and Massillon, Ohio; and Chicago, Illinois. Several cold finished bar plants are located across the country.

LTV Steel Tubular Company has operations in Ohio, Tennessee, Georgia and New York. The headquarters for LTV Steel is in Cleveland, Ohio.

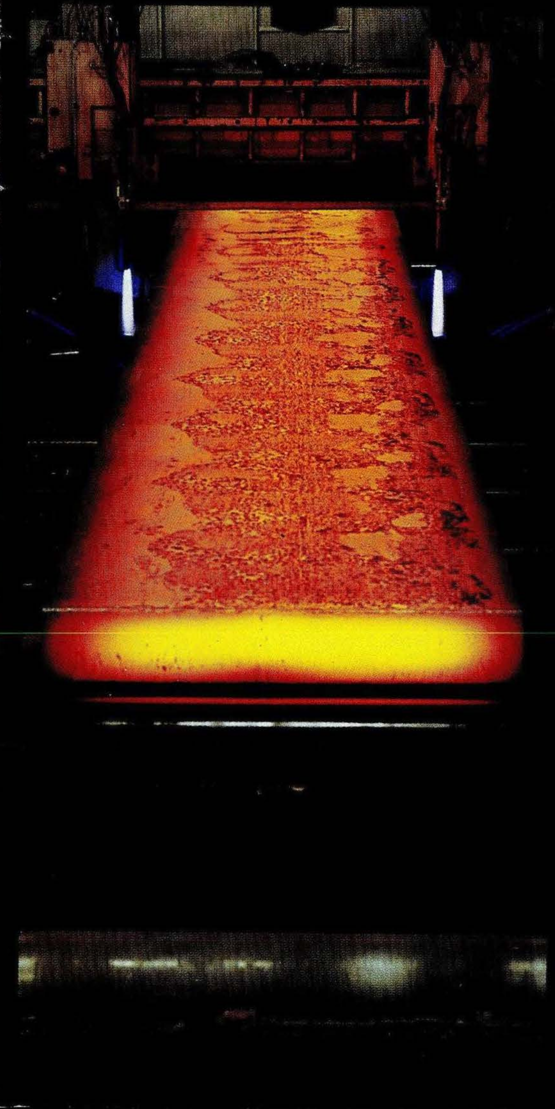
LTV Steel

Indiana Harbor Works
3001 Dickey Road
East Chicago, IN 46312

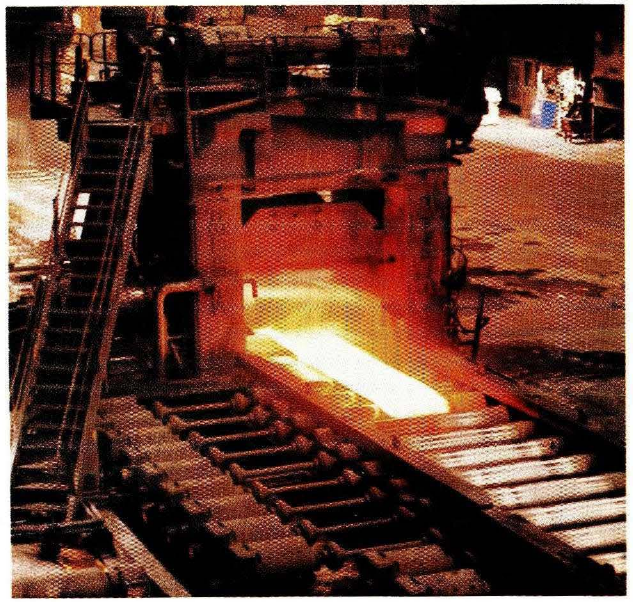
9/87

LTV Steel

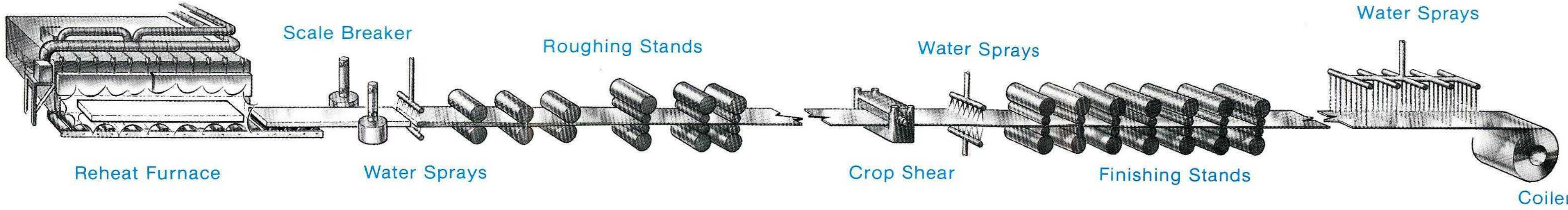
steel producing department



INDIANA HARBOR WORKS



Approximately 85 percent of the slab reduction occurs in the roughing stands.



The glowing red slab enters the rolling system after being removed from the furnace and placed on a table consisting of cylindrical rollers, which are powered by electrical motors. The slab is carried first into a vertical edger which reduces the width and breaks the scale (iron oxide deposits formed in heating). The broken scale then is removed by high-pressure water sprays.

Then the slab passes through six roughing stands, each containing horizontal rolls which squeeze the slab making it longer and thinner. Vertical rolls in four of six computer-controlled roughing stands govern the width of the slab as it is reduced in thickness. After exiting the six roughing stands, a slab which originally measured 7 to 11 inches thick measures 1¼ inches thick.

From the last roughing stand, the steel passes through seven finishing stands for final reduction. As the steel is reduced in thickness, each stand operates at a higher speed than the preceding stand.

As the slab progresses through the roughing and finishing stands, sensing devices continually record its thickness, width, temperature and the power needed to turn the rolls. Deviations are noted by the operators, controls reset and rolling speeds adjusted to ensure a properly finished end product.

As the steel moves from the last finishing stand and onto the runout table to be cooled by jets of water, it travels at speeds reaching 45 miles per hour. Water sprays located above and below the rollers rapidly cool the steel strip on the 450-foot-long runout table. This table also carries the strip to the coilers.

At the coiler area, a half-mile-long strip of steel is wound on one of three coilers in less than one minute. The coil is removed from the winding reel and placed on end onto a conveyor system.

Coils of steel rolled on the hot strip mill are known as "hot bands." They can be sold in this form to customers or further processed into other finished products.

Steel from the hot strip mill moves by the conveyor system underground to the shipping area. Seventy-five percent of it is transported to other mills within Indiana Harbor Works or to LTV Steel's finishing plant in Hennepin, Illinois for further processing into "cold rolled" sheet, galvanized sheet or tin plate.

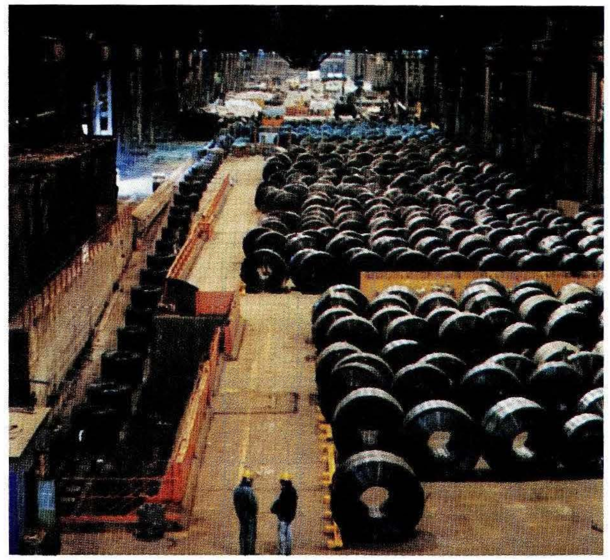
Finishing Department

In the finishing department, a temper mill gives the steel uniform flatness and hardens its surface by unwinding the coil and passing the steel between two rolls. Other finishing functions may include unwinding the steel coil and side trimming it with rotary shears on the slitter line or cutting the steel on the shear line into lengths of a specified size for shipping in flat sheets.

Control of Product Quality

Close coordination during the rolling operation is required to obtain the specific width, gauge (thickness) and metallurgical composition of the steel specified by the customer. Thus, production requires strict control of operations from heating the slabs through rolling, cooling and coiling the thin strip into a band.

Control of production begins with making sure the steel slab is heated to a uniform temperature throughout the slab. Next the slab must be rolled down to a predetermined intermediate thickness in the roughing mills. As it leaves the last roughing stand, it should be flat, straight, free of furnace scale and true to width. Next, the finishing train (set of stands) must be operated with careful and precise regulation to obtain a finished hot rolled product of high quality. Again, surface, thickness, width, temperature and cross-section contour of the product are required to meet given standards which depend upon the ultimate use of the steel.



As the coils are moved via a conveyor system to the coil storage area, they are categorized and stacked horizontally according to destination.

Variations such as the speed by which the steel travels through the stands, its cooling by the water sprays, the contour or the surface of a roll which comes in contact with the surface of the steel can affect the finished quality of the steel, and thus must be monitored carefully.

Further handling of the steel during coiling, tandem rolling, slitting, shearing, packaging and shipping, must conform to customer specifications.

Energy Usage

During a normal 24-hour period, the 84" hot strip mill uses:

— 144,728,000 gallons of water (equivalent to the daily use of a city with a population of 220,000).

— 28,235,000 cubic feet of natural gas (equivalent to a city with a population of 170,840).A program is underway to "hot charge" newly made slabs directly from the continuous casting facility into the reheat furnaces. Because these slabs are already at a temperature of 1,000 degrees Fahrenheit, they require less time in the reheat furnace to reach the proper rolling temperature.

— 1,323,000 kilowatt hours of electricity (equivalent to a city of 112,400).

— 1,320,000 BTUs of steam.

Welcome To The 84″ Hot Strip Mill Of LTV Steel's Indiana Harbor Works

The Indiana Harbor Works is the home of one of the two 84″ hot strip mills within LTV Steel. The Indiana Harbor Works mill, which began production in 1968, is considered one of the most modern in existence. It features a completely computerized, automated, flat rolling operation with a capacity of 4.2 million tons a year.

The hot strip mill, equipped with motors totaling 320,000 horsepower, can turn a red hot slab of steel into a coil of thin steel in less than four minutes. The coil may be shipped to customers as is, or it may be cleaned and processed by the hot strip finishing mill or other LTV Steel finishing mills to make more sophisticated products.

The capabilities of LTV Steel's extra-wide 84″ hot strip mill allow steel to be rolled in a variety of sizes. The mill's basic function is to reduce steel slabs which can weigh between 9 and 40 tons, and can measure 7 to 11 inches thick, 2 to 6½ feet wide and 13½ to 36 feet long into a coiled strip ½ to 1/16 of an inch thick and 1/10 to 4/5 miles long.

Operations

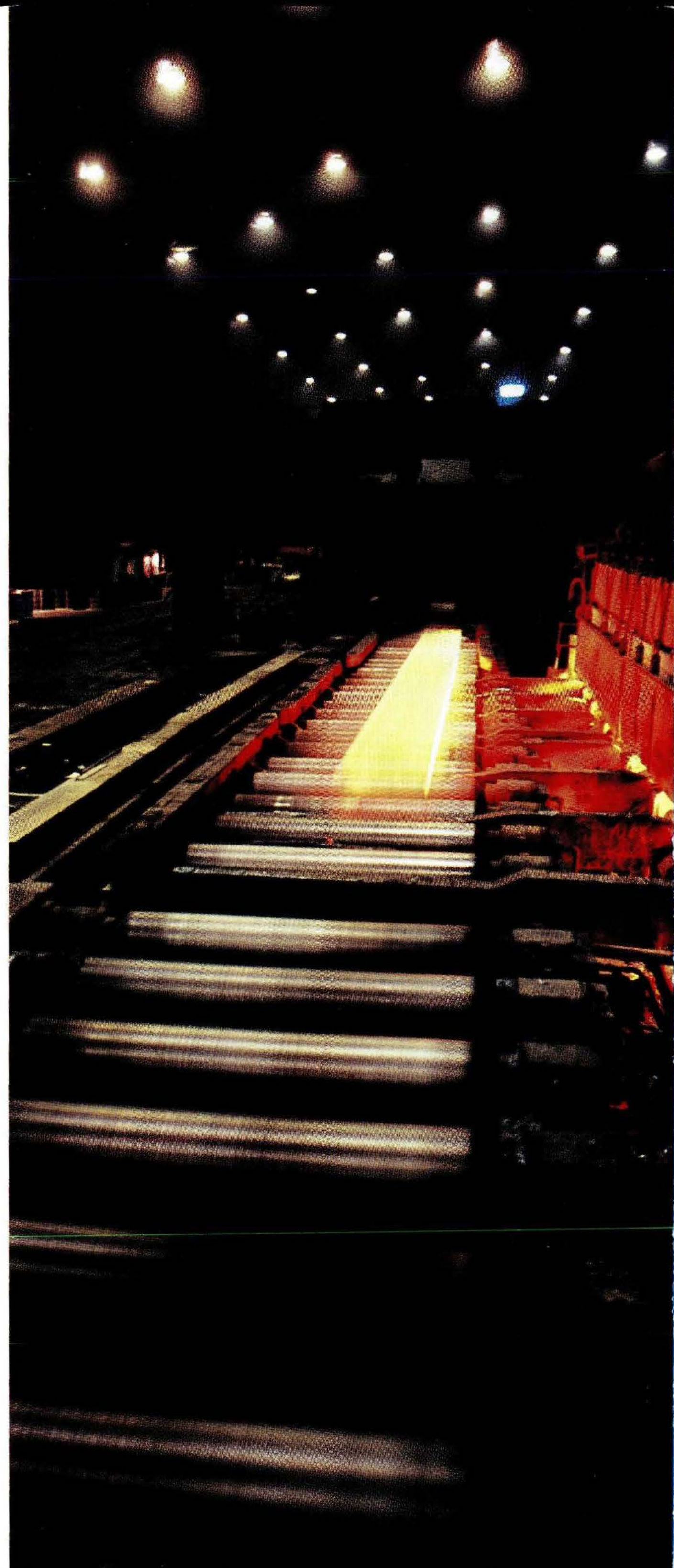
Hot Rolling Solid Steel

The hot rolling process begins when a steel slab received from the continuous casting complex is heated to 2400 degrees Fahrenheit in one of three reheating furnaces. A reheat furnace can hold and heat as many as 50 slabs of steel depending on the size of the slabs.

When a slab is pushed into the furnace for heating, a punched card containing all the pertinent information needed to roll the slab is fed into the mill's computer.

Cover: The control room for the roughing stands includes five video screens used for tracking the slab through the six stands.

Right: A table of rollers, powered by electrical motors, carries the hot steel slab into a vertical edger to reduce the width and break the scale before the slab enters the roughing stands.



The LTV Story

LTV Steel is a fully integrated steel company with facilities for producing a diversified line of carbon, alloy and stainless steel products.

The company is the nation's second-largest steel manufacturer, employing 35,000 people. It has annual sales in excess of $5 billion and annual shipments of more than 10 million tons.

Indiana Harbor Works produces flat rolled steel destined for use in automotive, appliance, agriculture, packaging, building and electrical industries. The company operates flat rolled steel plants and facilities in Aliquippa, Pennsylvania; Cleveland and Warren, Ohio; and Hennepin, Illinois. Bar operations are located in Canton and Massillon, Ohio; and Chicago, Illinois. Several cold finished bar plants are located across the country.

LTV Steel Tubular Company has operations in Ohio, Tennessee, Georgia and New York. The headquarters for LTV Steel is in Cleveland, Ohio.

LTV Steel

Indiana Harbor Works
3001 Dickey Road
East Chicago, IN 46312

9/87

LTV Steel

84″ hot strip mill

INDIANA HARBOR WORKS

A Flow Chart of Steelmaking at Indiana Harbor Works

It takes three raw materials to make steel: iron ore, limestone and coal.

Before arriving at the Indiana Harbor Works, the iron ore is mined, crushed and made into pellets, and the limestone is quarried and crushed. Meanwhile at the plant, recovered iron particles are "sintered" or fused into larger pieces to be used in ironmaking.

Coal is heated in ovens to form coke, the fuel which helps generate tremendous heat needed for the blast furnace.

The iron ore, the limestone and the coke are joined in the blast furnace, where high temperatures and the limestone remove oxygen and impurities, leaving almost pure iron.

This molten iron, along with scrap metal, is then poured into the plant's modern basic oxygen furnace, known as the BOF, to be refined further still into steel.

High-purity oxygen, blown into the furnace at jet-like speed, combines with carbon and other unwanted metals to reduce the impurities. Lime and other materials are added to help carry off the oxidized impurities.

Molten steel from the BOF is transported by a huge ladle to LTV Steel's continuous casting facility.

Continuous casting is the newest one-step, non-stop process which replaces the ingot sequence of forming slabs. The first stop is the argon stirring facility where argon gas is bubbled through the steel to help remove impurities and assure uniform temperature. Alloys are added according to the type of steel desired by the customer. Then the ladle of molten steel is lifted to the top of the caster and poured into a reservoir called a tundish. The steel flows from the tundish into the mold where water cooling begins. By the time the steel leaves the mold, the metal has begun to harden. The steel continues to solidify as it descends through the water-cooled rolling system until it is solid throughout the slab.

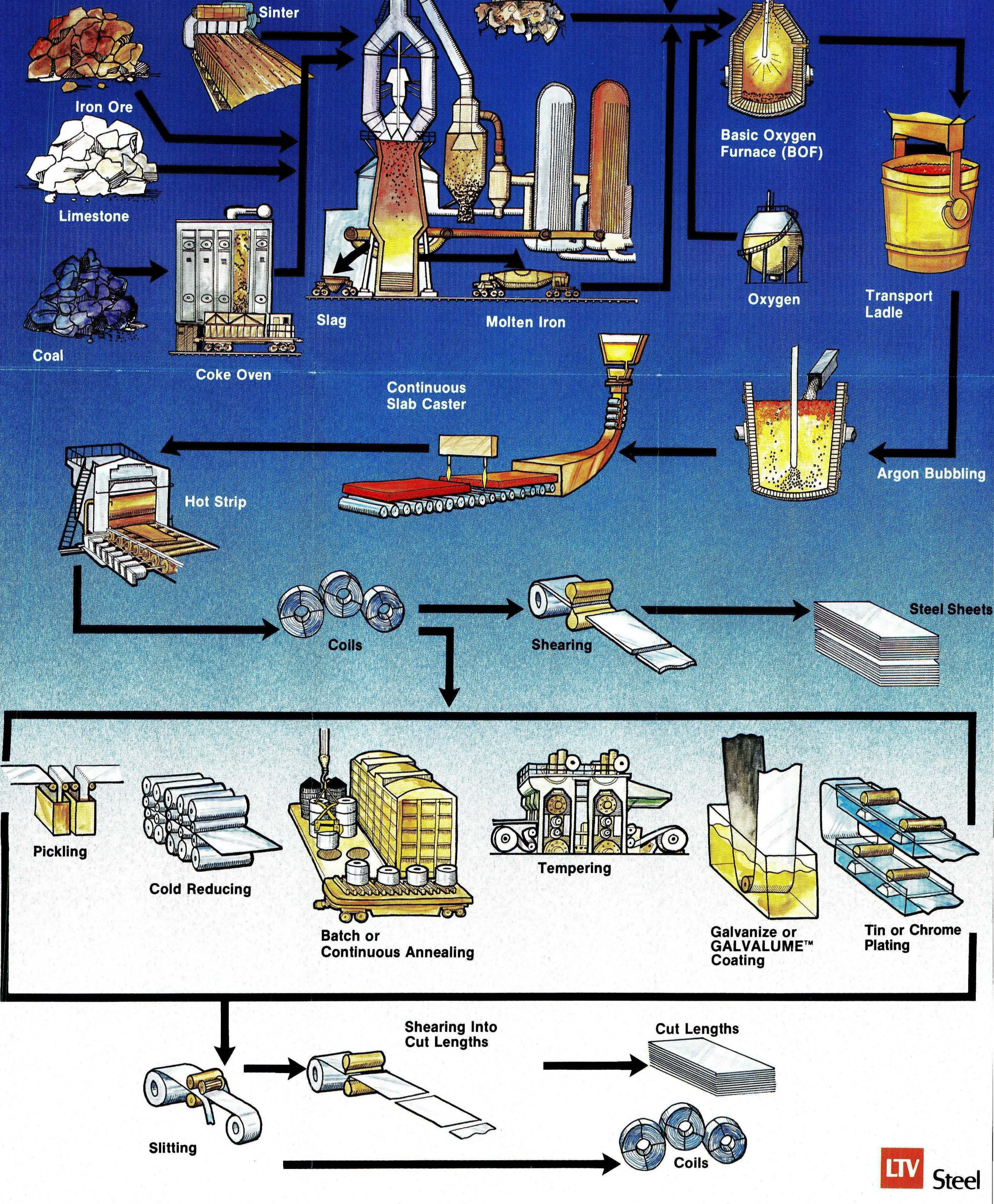
At the Indiana Harbor Works, the slabs from the continuous caster are rolled into strips and wound into coils in the hot strip mill. At this point, the basic steelmaking process is completed and the custom-tailoring begins.

The hot rolled coils may go through many processes before delivery. In fact, LTV Steel provides over 150 possible finishing and processing combinations in order to meet the customer's specifications exactly.

The finishing processes include shearing into sheets; pickling, or cleaning in an acid bath; cold strip reduction, which reduces the thickness and hardens the metal; annealing, or heating the hardened metal to make it more formable, and temper rolling to give it the desired hardness, flatness and surface quality.

The finished product may then be coated and side-trimmed or sheared into cut lengths.

Finally, the steel is shipped to the customer to make the products which are basic to everyday life.



LTV Steel

Indiana Harbor Works

LTV Steel's Indiana Harbor Works, located in East Chicago, Ind., is a fully integrated steelmaking and finishing facility. It has three blast furnaces, a modern two-vessel basic oxygen furnace, a continuous slab casting complex, an 84" hot strip mill, two cold reduction sheet mills, two galvanizing lines, one being a convertible coating line capable of producing either galvanize or *GALVALUME™ sheet steel and a tin mill.

As evidenced by its production units, Indiana Harbor is a major producer of flat rolled sheet products serving the automotive, agriculture, appliance, food processing and beverage markets. Other major markets are transportation equipment, commercial building materials, farming and construction equipment and the steel service center industry.

The plant covers more than 1,200 acres on the southern shore of Lake Michigan, and employs approximately 4,700 men and women. Its steelmaking capacity exceeds 3.3 million tons annually.

Indiana Harbor Operations

Iron Foundry

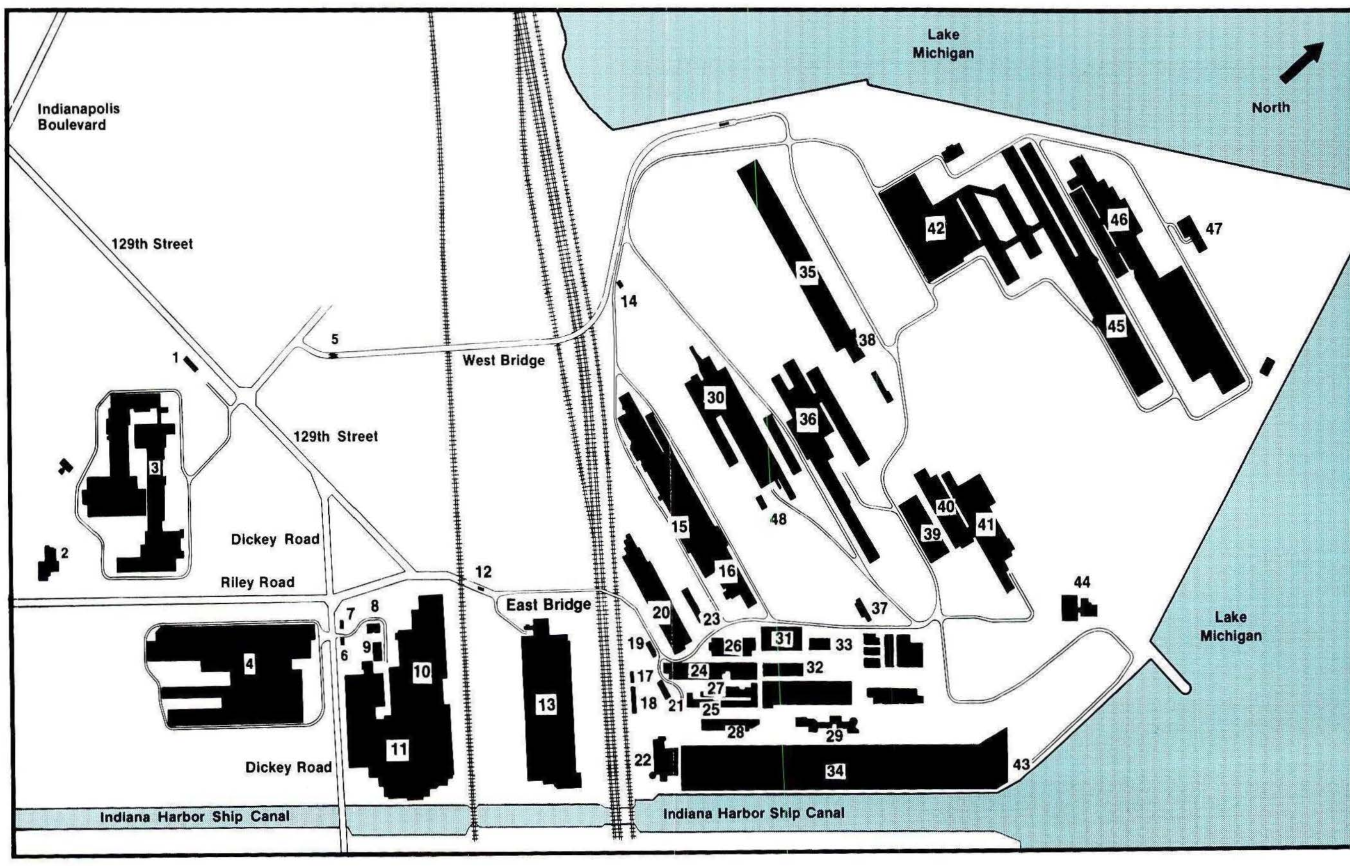
The iron foundry supplies ingot molds and stools, cast from molten iron, for use in the steelmaking process at other LTV Steel plants. Opened in 1967, the foundry was expanded in 1982 and now can produce 500 tons of molds and stools per day. The ingot molds come in various sizes and shapes according to the end use of the product.

Blast Furnaces

There are three operable blast furnaces at the Indiana Harbor Works which provide molten iron for its two basic oxygen furnaces, where the iron is further refined into steel.

The No. 1 and No. 3 furnaces are currently in operation. The No. 3 furnace has outperformed all other single-taphole furnaces in North America, with production of more than 4,500 tons of iron per day. The No. 4 blast furnace, which has a daily capacity of 4,750 tons a day, is being renovated and will resume operations by July 1987.

*GALVALUME is a registered trademark of BIEC International, Inc.



Steel Producing

Steel is produced from scrap steel and blast furnace hot metal in two 285-ton vessels in the modern basic oxygen furnace (BOF) shop. The furnace uses one ton of oxygen per minute during the 18 minutes oxygen is blown. A 285-ton heat is produced in approximately 30 minutes. Then the molten steel is taken by ladle to LTV Steel's new continuous slab casting complex to be formed directly into slabs.

The continuous casting facility, which began operations in October 1983, is the most technically advanced in the Western Hemisphere with a production rating of 280,000 tons per month. The facility has two casting machines - one casting two narrow slabs between 28 and 42 inches wide and the other casting one slab 40 to 78 inches wide.

Indiana Harbor Works

1. Visitor Reception
2. Central Treatment Plant
3. Tin Mill
4. No. 2 Sheet Mill
5. West Bridge Entrance
6. Employment/Insurance Office
7. Safety Office
8. Tin Mill Hospital
9. Training Department
10. Central Spares
11. Tin Mill Warehouse
12. East Bridge Entrance
13. Coke and By-Products Plant (operation ceased)
14. Transportation Department
15. Roll Shop Office
16. Garage
17. Utilities Department
18. SP Quality Control
19. Main Office Building
20. Iron Foundry
21. Commissary Building
22. Sinter Plant
23. Locomotive Shop
24. Parking
25. Boiler House
26. Central Shops
27. Power House
28. Blast Furnace No. 1
29. Blast Furnaces Nos. 3 and 4
30. No. 2 Open Hearth (operation ceased)
31. Pipe Shop
32. Field Maintenance
33. Fab Shops
34. Ore Dock-Raw Materials
35. Seamless Pipe Mill (operation ceased)
36. Slabbing Mill (operation ceased)
37. Motor Pool and Fire Dept.
38. Steel Plant Hospital
39. BOF Mold Prep. Bldg.
40. Continuous Slab Casting Complex
41. Basic Oxygen Furnace (BOF)
42. No. 3 Sheet Mill
43. Barge Shipping Dock
44. Steel Plant Filtration Station
45. 84" Hot Strip Finishing Department
46. 84" Hot Strip Mill
47. 84" Hot Strip Filtration Plant
48. Mason Department

84" Hot Strip & Finishing Mill

Slabs are rolled into "hot bands" or coils at the 84" hot strip mill. Completed in 1968, it is considered one of the finest hot strip rolling mills in the country. It has three reheat furnaces, six roughing stands, seven finishing stands and three coilers. It produces sheet to a finished width of 76½" and gauge down to .054" min. It has a rated capacity of 4.2 million tons annually. A temper mill provides processed band capability.

No. 2 Sheet Mill

No. 2 sheet mill was built in 1954. The operating units consist of a 60" continuous pickler, which cleans all of the hot bands produced for tin plate at Indiana Harbor, and two coating lines. The 60" line, built in 1962, is capable of producing regular zinc-coated galvanize steel or an aluminum-zinc alloy-coated sheet known as GALVALUME steel. The 72" line was built in 1964 and coats most of the galvanized sheets produced at Indiana Harbor.

No. 3 Sheet Mill

The No. 3 sheet mill was built in 1965. It has a continuous pickling line which is 1,320 feet long, a five-stand tandem mill, a modern direct-fire annealing operation, a two-stand temper mill, a recoil line and a slitting line. It can produce a finished sheet up to 74" wide in gauges from .014" to .104". It also produces all steel requirements for No. 2 sheet mill's two coating lines. Its rated annual capacity is 1.2 million tons.

Tin Mill

The tin mill features a halogen tinning line and a chrome line. Built in 1957, the 52" mill produces finished tin plate to a maximum width of 45" in gauges ranging from .0072" to .0359". It has a cleaning line, continuous annealing line, two-stand temper mill, and three shear lines, in addition to its coating lines. It also features a six-stand tandem cold reduction mill with a capacity of 600,000 tons per year.

Front Cover: Coils of flat rolled steel produced at LTV Steel's Indiana Harbor Works are destined for use in such markets as automotive, appliance, metal building, steel service center, food processing and beverage.

The LTV Story

LTV Steel is a fully integrated steel company with facilities for producing a diversified line of carbon, alloy and stainless steel products.

The company is the nation's second-largest steel manufacturer, employing 35,000 people. It has annual sales in excess of $5 billion and annual shipments of more than 10 million tons.

Indiana Harbor Works produces flat rolled steel destined for use in automotive, appliance, agriculture, packaging, building and electrical industries. The company operates flat rolled steel plants and facilities in Aliquippa, Pennsylvania; Cleveland and Warren, Ohio; and Hennepin, Illinois. Bar operations are located in Canton and Massillon, Ohio; and Chicago, Illinois. Several cold finished bar plants are located across the country.

LTV Steel Tubular Company has operations in Ohio, Tennessee, Georgia and New York. The headquarters for LTV Steel is in Cleveland, Ohio.

LTV Steel

Indiana Harbor Works
3001 Dickey Road
East Chicago, IN 46312

11/86

INDIANA HARBOR WORKS

LTV Steel

Welcome To The Tin Mill of LTV Steel's Indiana Harbor Works

The Indiana Harbor Works is the home of one of LTV Steel's two tin mills. Built in 1956, the mill has been expanded and rehabilitated to include new processing units which increased capacity and product lines. The mill now produces tin plate, black plate, chrome plate and cold rolled sheet (tinned or black).

Tin mill products are primarily used to make food and beverage cans or paint and solvent containers. American consumers take advantage of the strength, versatility and convenience of tin products and use over 4.5 million tons of them annually.

Approximately 70 percent of the products produced at Indiana Harbor's tin mill are sold to can manufacturers. The other 30 percent are used for such diverse products as curtain rods, toys, shelving, gaskets, oil filters, air cleaners, book binders, etc.

Operations

"Hot Band"

A hot band is the starting raw material for the Indiana Harbor tin mill in producing tin products. A hot band is produced by rolling a slab of steel, heated to 2400 degrees Fahrenheit, into a long, thin "band" which is wound into a coil. The hot bands are produced at Indiana Harbor's 84" hot strip mill and shipped to the Harbor's No. 2 sheet mill for pickling.

Pickling

After cooling, the hot rolled band is uncoiled and pickled to remove the oxide formed in the hot rolling process. In the pickling operation, the strip first passes through a series of tanks or sprays of diluted acid and is rinsed with water. The pickled strip then is dried, trimmed, oiled and recoiled. The oil serves as a protection against rusting prior to, and as a lubricant during cold reduction.

The tin mill's continuous annealing line is a 70-foot-high structure housing a furnace.

The LTV Story

LTV Steel is a fully integrated steel company with facilities for producing a diversified line of carbon, alloy and stainless steel products.

The company is the nation's second-largest steel manufacturer, employing 35,000 people. It has annual sales in excess of $5 billion and annual shipments of more than 10 million tons.

Indiana Harbor Works produces flat rolled steel destined for use in automotive, appliance, agriculture, packaging, building and electrical industries. The company operates flat rolled steel plants and facilities in Aliquippa, Pennsylvania; Cleveland and Warren, Ohio; and Hennepin, Illinois. Bar operations are located in Canton and Massillon, Ohio; and Chicago, Illinois. Several cold finished bar plants are located across the country.

LTV Steel Tubular Company has operations in Ohio, Tennessee, Georgia and New York. The headquarters for LTV Steel is in Cleveland, Ohio.

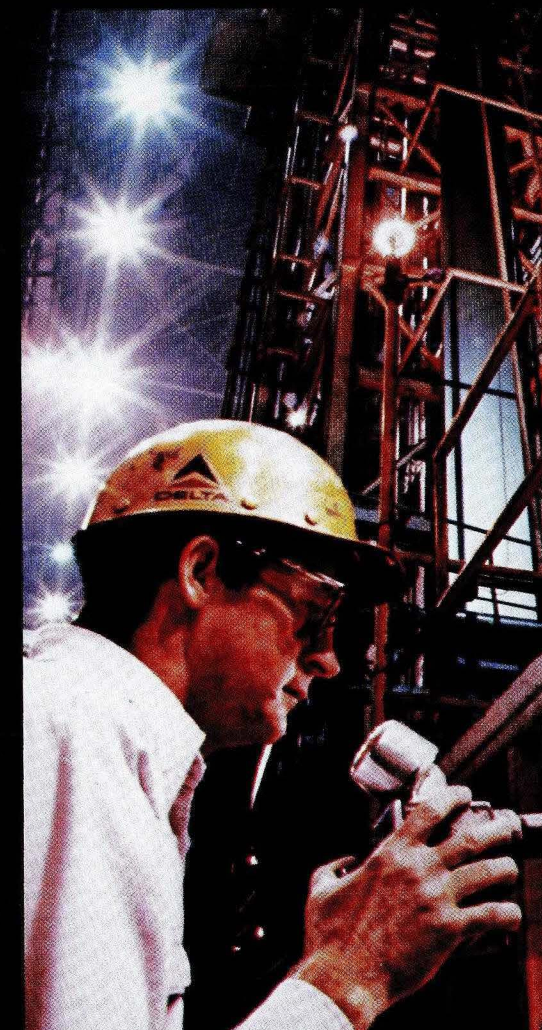
LTV Steel

Indiana Harbor Works
3001 Dickey Road
East Chicago, IN 46312

9/87

LTV Steel

tin mill

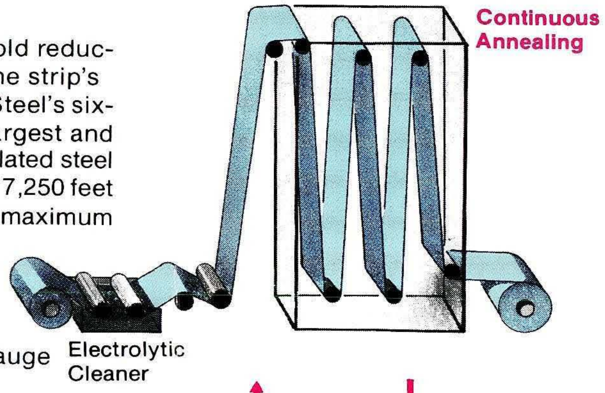


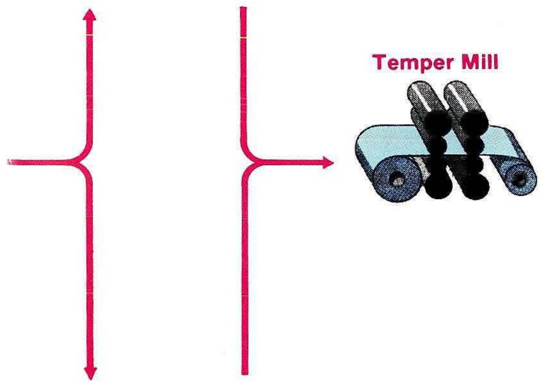
INDIANA HARBOR WORKS

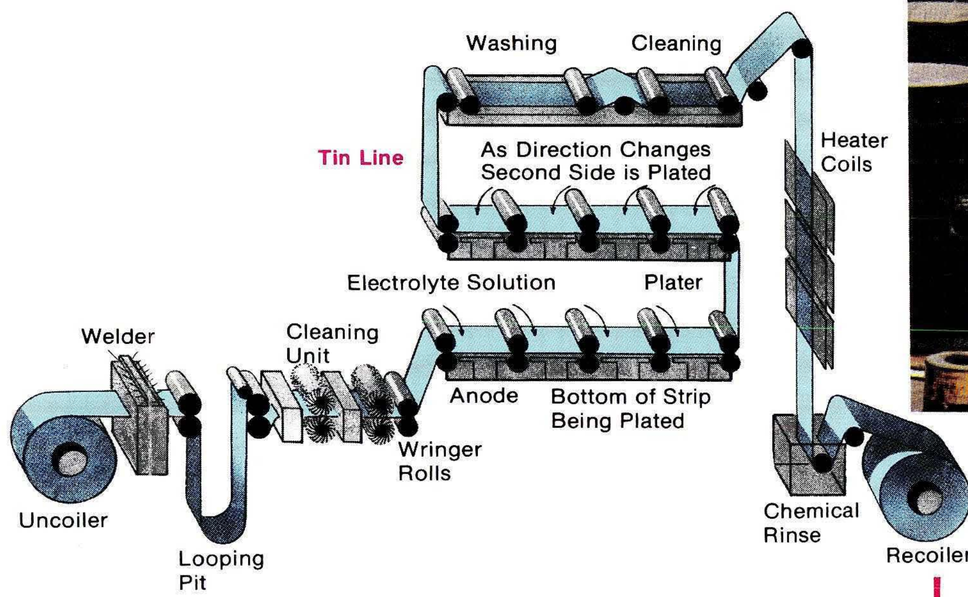
Cold Reduction

The first process in the tin mill is the cold reduction mill. The cold mill further reduces the strip's gauge to nearly the final thickness. LTV Steel's six-stand cold reduction mill is among the largest and fastest units in the industry for rolling tin-plated steel strip. At top speed, the mill can roll steel at 7,250 feet per minute. The rolls can be accelerated to maximum speed in 14 seconds and stopped in seven seconds.

The mill can handle coils up to 62,100 pounds. A coil this size in the thinnest gauge would stretch approximately 17 miles.





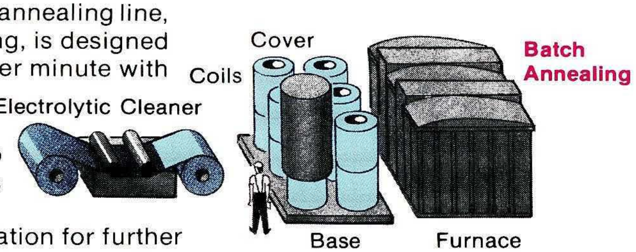


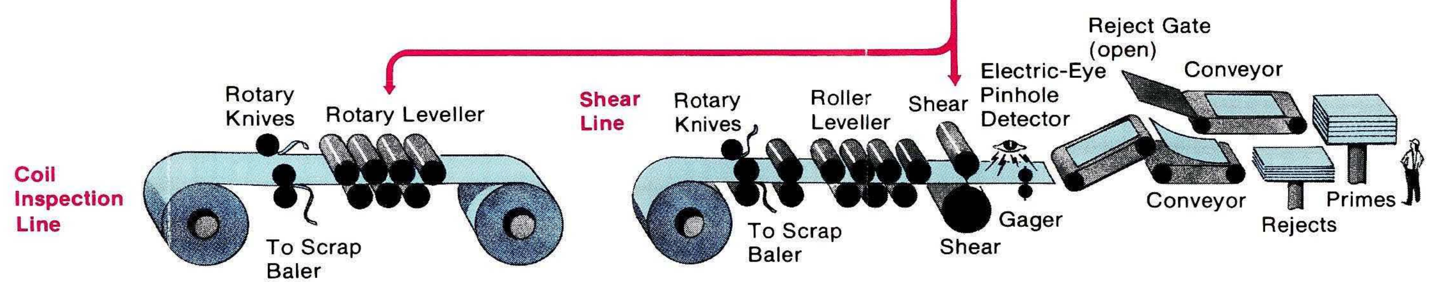
The tin mill's batch annealing department contains four furnaces capable of servicing 40 stacks of four steel coils each.

Continuous or Batch Annealing

After the steel exits the cold reduction mill, it moves into either the continuous annealing line or the batch annealer. Annealing restores ductility after cold reduction. The continuous annealing line, a tower 70 feet high and 135 feet long, is designed to operate at a speed of 2,000 feet per minute with a capacity of 60 tons per hour.

As the strip uncoils and passes up and down through the annealer, it is subjected to heat at 1,250 degrees Fahrenheit which softens it in preparation for further processing. The entire annealing process of a strip takes about one minute.





Batch annealing is accomplished by stacking the coils in a sealed container and slowly heating and cooling the coils to designated, critical temperatures. The purpose of this type of annealing is to relieve stresses produced during reduction and to keep oxidation at a minimum.

Temper Mill

Following the annealing process, the strip is rolled on the temper mill to give it the desired flatness, surface hardness and finish. This is accomplished by passing the strip through two stands, each containing four rolls. At this point the product coming off the mill is known as "black plate" and may be shipped to customers in this form.

Coating

After temper rolling, the strip moves to the halogen tinning line, the "heart" of a modern tin mill. Here the strip receives a series of treatments in a continuous process. At the start of the line, the front end of one coil of steel is welded to the back end of the one ahead. The steel is washed with alkaline detergents, scrubbed with rotating brushes, and cleaned in a dilute acid before it enters the electrolyte solution where it is electroplated. In the plating section, the strip is barely immersed in the solution and is plated on the bottom side only. The strip then is turned and plated on the other side. The coating may be as thin as .05 pound on a side.

The plated strip is washed and rinsed again before it passes through a frequency induction heating unit. The tin melts, giving the product the bright finish commonly associated with tin plate. The strip is then quenched or cooled in water, chemically treated and rinsed. Finally, it is oiled to prevent scratching.

The tin mill also has a chrome plating line, installed in 1968, for chrome coating. Electrolytic chrome-coated steel serves as a substitute for tin coating in many applications. The operation of the chrome line is similar to the halogen line.

Finishing

Line inspecting, counting, shearing or coiling, weighing and packaging for shipment complete the sequence for both products. Tin plate, black plate and chrome-coated steel are produced in coils and cut sizes or lengths.

The trimming and shearing of coils are performed in a series of units. At the coil inspection unit, the strip is fed into a side trimmer, which trims both edges of the strip. This unit also has a welder for use in tailoring coil size to customer specifications.

For cut lengths, a roller leveller flattens the strip and feeds it into an automatic shear. As the tin plate is sheared, it is inspected and sorted into piles for shipment.

LTV Steel

Station Location Map Zones 0-7

ZONE 0

000 Indiana Harbor Works
001 Main Office
002 Security Department
004 Building Maintenance
007 Iron Foundry
008 Paint Shop
010 Steel Plant Carpenter Shop
013 Locomotive Shop
015 No. 1 O.H. Sub Station
016 Iron Foundry
017 Iron Foundry Office
018 Iron Foundry
020 Utilities Maintenance
022 Utilities Superintendent's Complex
024 Chemical Services
025 Flat Roll Chem Lab
026 Chemical Services/Industrial Engineering
027 Utilities Power House
029 Blast Furnace Welfare
030 Utilities Boiler House
031 Blast Furnace Superintendent's Complex
033 B.F. Yardmaster's Office
034 B.F. H-1 Furnace Sub-Station
036 B.F. Sinter Plant Office
038 B.F. Ore Dock Office South
039 B.F. Sinter Plant
040 B.F. Recirculation Plant
042 B.F. Maintenance Office
044 B.F. Tool Room
045 Utilities #7 Boiler
046 Utilities #5 Boiler
047 Utilities #3 Boiler
048 Utilities Pump House
049 Utilities Water Treating
050 Blast Furnace H-1 and H-2 Furnace
052 B.F. H-2 Furnace
054 B.F. Oiler Shanty
056 B.F. Motor Inspectors
057 B.F. Millwrights
060 B.F. H-3 Furnace
062 B.F. H-3 Furnace Sub-Station
064 B.F. H-3 and H-4 Pump House
066 B.F. Ladle Repair
067 B.F. H-3 Computer Building
068 B.F. Pump Repair
070 B.F. Furnace Warehouse
072 B.F. Warehouse Receiving
074 B.F. Labor Office
076 B.F. Safety Office
078 B.F. Warehouse
080 B.F. H-4 Furnace
082 B.F. H-4 Furnace Sub-Station
084 B.F. No. 5 Sub-Station
086 B.F. Ore Dock Office North
088 B.F. Barge Dock Office
090 Utilities No. 1 Pump House
092 Blast Furnace Warehouse Annex
094 B.F. Warehouse North
096 Environmental Control/ Integrated Process Control

ZONE 1

100 Machine Shop Southwest
102 Services Planning Shops Supt. Machine Shop Offices
104 Machine Shop
106 Machine Shop Warehouse South
108 Electric Shop
110 Machine Shop North
112 Field Maintenance
114 Machine Shop East Welfare
116 M.S. Southeast
118 M.S. Warehouse North
121 Pipe Shop
124 Bull Gang
127 Line Shop
128 Electrical Testing
129 Line Shop-North
130 EIRTS Building
133 Bridge Shop Field Office
136 Fabricating and Weld Shop South
139 Fabricating and Weld Shop West
142 Refrigeration Shop
145 Fabricating and Weld Shop North

ZONE 2

200 Mobile Equipment Repair
202 Mobile Equipment Repair
206 Transportation Services Switch Man's Welfare
208 Labor Dept. Storage
210 Transportation Services Superintendent's Complex
215 Purchased Services
220 Computer Process Control
230 R.R. Car Repair
240 Transportation Services Railroad Operations
244 11 Storage Shanty
245 Heckett Engineering
250 Crane Repair Receiving
260 Utilities Merchant Mill Oil House

ZONE 3

300 Motor Pool
305 Fire Prevention
307 Fire Prevention Receiving
310 Motor Pool Welfare
315 Environmental Lab
320 Rail & Yard Services
326 No. 8 Lift Station
330 Mason Dept./Janitorial Services
335 Mason Dept. & Steel Producing Material Storage
340 Steel Producing Ladle Cover Repair
342 Slab Preparation — East
344 Slab Preparation — West
346 No. 2 O.H. Kitchen
350 No. 2 Slabber Stripper Office
355 Slab Conditioning Welfare
360 No. 2 Slabber Main Slab Mill
365 Electrical Testing P.C.B. Storage
370 No. 2 Slabber No.2 Slab Yard
375 No. 2 Slabber No. 3 Slab Yard — West
380 No. 2 Slabber No. 3 Slab Yard — East
385 No. 2 Slabber Slab Conditioning Office
390 Slab Conditioning/Quality Control Complex
395 Met Lab N.D.T. Slab Conditioning

ZONE 4

400 Steel Producing Superintendent's Complex
402 S.P. Receiving
405 S.P. LMF Bag House
408 S.P. LMF Water Treatment Facility
411 BOF Pouring Pit — East
414 S.P. BOF Material Storage Area
416 Trans. Services (Caboose)
417 Utilities Terminal Lagoon Treatment Facility (M.S.D.)
420 Steel Producing BOF Hopper House
423 S.P. BOF Precipitator Bag House
426 S.P. BOF Material Receiving
429 S.P. BOF Electrical Sub-Station East End
432 S.P. BOF Precipitator
435 S.P. BOF Scrap Yard
438 S.P. BOF Maintenance West End
441 S.P. BOF Teeming Aisle West End
444 S.P. BOF Teeming Aisle South End
445 S.P. Caster Bag House
447 S.P. Caster Tundish Yard East End
450 S.P. Caster Tundish Yard West End
453 S.P. Caster Maintenance West End
456 S.P. Caster Slab Shipping
462 S.P. Caster Water Treatment Facility
465 S.P. Scrap Handling
468 S.P. LMF Reline Area
470 S.P. Caster South Entrance
471 S.P. LMF Building
480 Levy Co. Shop Bldg.
490 Utilities - Foamite Bldg.
492 Utilities - Oil House
496 Utilities - Oil Barge Dock

ZONE 5

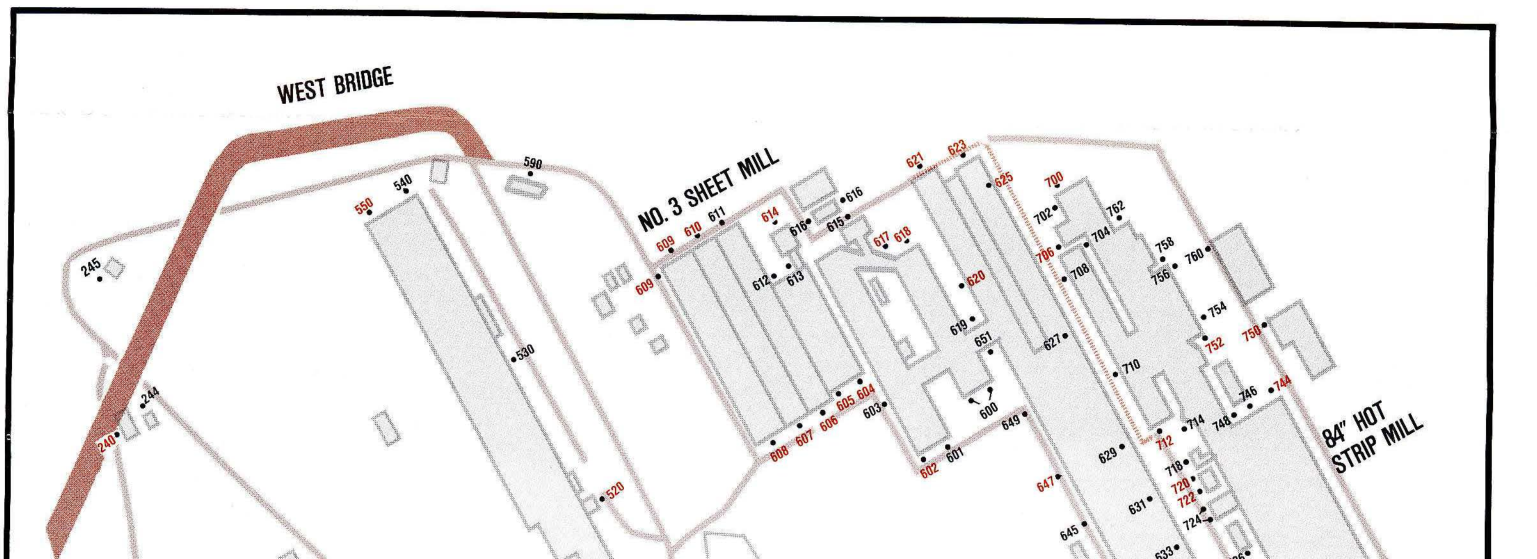
500 Utilities No. 2 Pump House
502 Utilities No. 2 Pump House
510 Steel Plant Paint Shop
520 Steel Plant Hospital
530 No. 9 Lift Station
540 Engineering Storage Area
550 Steel Producing Spares Annex
590 West Bridge Truck Scale

ZONE 6

600 No. 3 C.R.S.M. Tandem Mill Motor Room
601 No. 3 C.R.S.M. H.N.X. Building
602 No. 3 C.R.S.M. Anneal Receiving
603 No. 3 C.R.S.M. Anneal Coil Storage
604 No. 3 C.R.S.M. Anneal Soft Coil Storage
605 No. 3 C.R.S.M. Maintenance Receiving
606 No. 3 C.R.S.M. Finishing Bldg. No. 9 East End/Receiving/Shipping
607 No. 3 C.R.S.M. Finishing Bldg. No. 10 East End/Receiving Shipping
608 No. 3 C.R.S.M. Warehouse Shipping East End
609 No. 3 C.R.S.M. Warehouse Shipping West End
610 No. 3 C.R.S.M. Finishing Bldg. No. 10 West End/Receiving/Shipping
611 No. 3 C.R.S.M. Finishing Bldg. No. 9 West End/Receiving/Shipping
612 No. 3 C.R.S.M. Temper Mill
613 No. 3 C.R.S.M. Building No. 7 West End
614 No. 3 C.R.S.M. Superintendent's Office
615 No. 3 C.R.S.M. Men's Welfare Building
616 No. 3 C.R.S.M. Outdoor Sub-Station North End & South End
617 No. 3 C.R.S.M. Light Truck Receiving
618 No. 3 C.R.S.M. Tandem Mill Roll Shop Receiving
619 No. 3 C.R.S.M. Tandem Mill Oil Receiving
620 No. 3 C.R.S.M. Pickle Line Acid Receiving
621 No. 3 C.R.S.M. Pickle Line Receiving/ Shipping
623 Hot Strip Finishing Coil Storage West End
625 Hot Strip Finishing Coil Storage
627 Hot Strip Finishing Coil Storage
629 Hot Strip Finishing O.L.T.M.
631 Hot Strip Finishing Shear Line
633 H.S.F. Slitter Line
635 H.S.F. Tractor Repair
637 H.S.F. Maintenance Receiving
639 H.S.F. Warehouse
641 H.S.F. Warehouse Shipping
643 H.S.F. Warehouse Shipping
645 H.S.F. Warehouse Shipping
647 H.S.F. Warehouse Receiving/Shipping
649 No. 3 C.R.S.M. Pickle Line Coil Storage
651 No. 3 Cold Roll Sheet Mill Pickle Line Office

ZONE 7

700 Hot Strip Coiler Maintenance
702 H.S. Mill Visitor's Exit
704 H.S. Runout Table
706 H.S. Roll Shop Receiving/Shipping
708 H.S. Roll Shop Roll Rack Area
710 H.S. Roll Shop Bearing Area
712 H.S. Maintenance Area Receiving/Shipping
714 H.S. Mill Building Roughing Mill Door
718 H.S. Computer Room
720 H.S. Superintendent Complex
722 H.S. Production Control Complex
724 H.S. Men's Welfare Building
726 H.S. No. 1 Scale Pit
728 H.S. Mill Visitor's Entrance
730 H.S. Pump House
732 H.S. Mill Building East End
734 H.S. Furnace Basement
736 H.S. Flat Roll Shops Pipe & Bridge
737 H.S. Slab Carrier Systems
738 H.S. Slab Yard East End
740 H.S. Slab Yard East End
742 H.S. No. 3 Pump House
744 H.S. Slab Yard West End
746 H.S. Slab Yard West End
748 H.S. Motor Room R-5 Area
750 H.S. Waste Water Treatment
752 H.S. Electrical Spare Parts Receiving/ Shipping
754 H.S. M.G. House
756 H.S. M.G. House Truck Ramp
758 H.S. Vent Room
760 H.S. Sub-Station No. 4
762 H.S. Motor Room West End



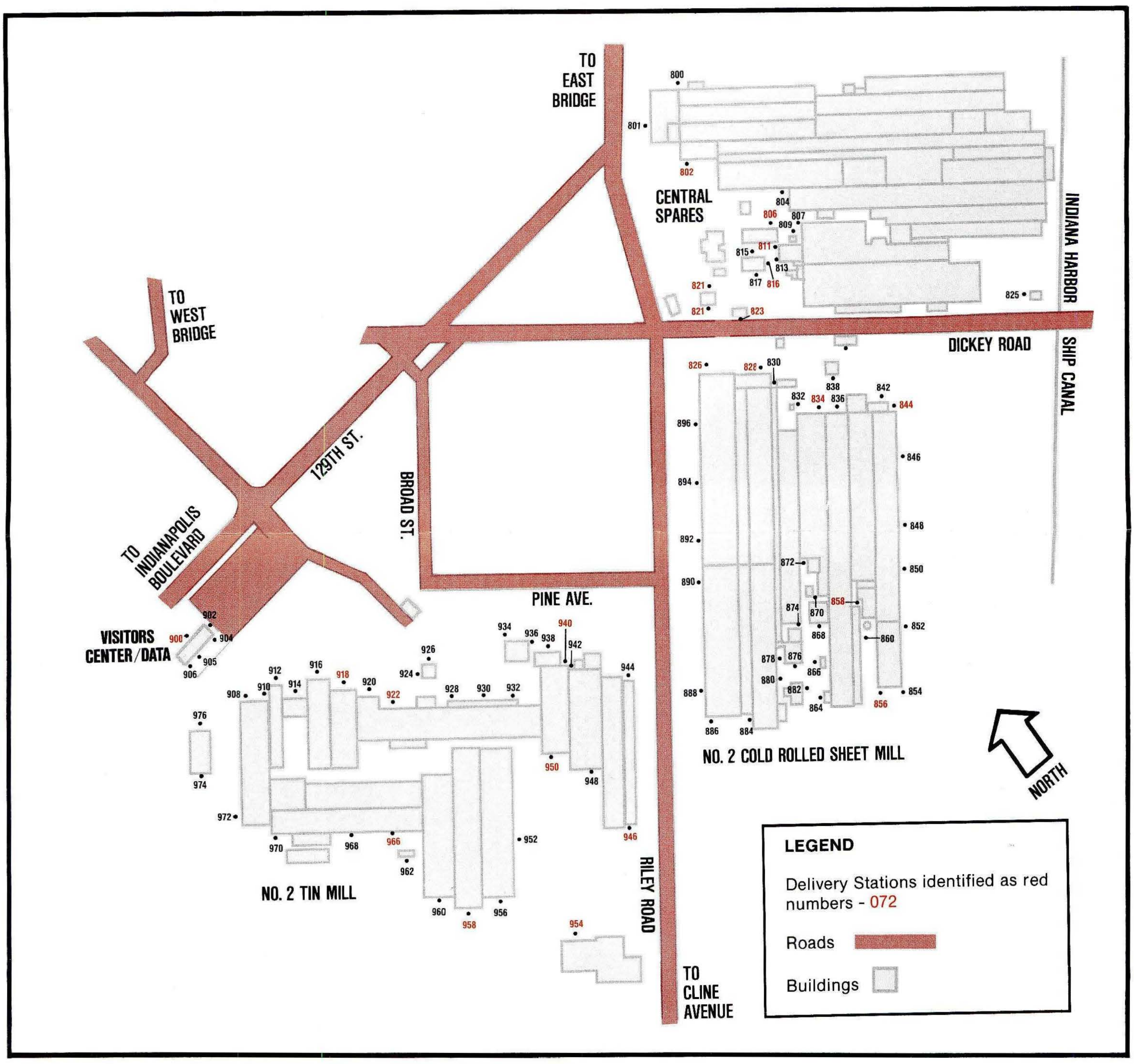
844 No. 2 C.R.S.M. Cold Roll Warehouse — North
846 No. 2 C.R.S.M. Cold Roll Warehouse Depressed Track
848 No. 2 C.R.S.M. Cold Roll Warehouse Depressed Track
850 No. 2 C.R.S.M. Cold Roll Warehouse Depressed Track
852 No. 2 C.R.S.M. Cold Roll Warehouse Depressed Track
854 No. 2 C.R.S.M. Cold Roll Warehouse Depressed Track — South

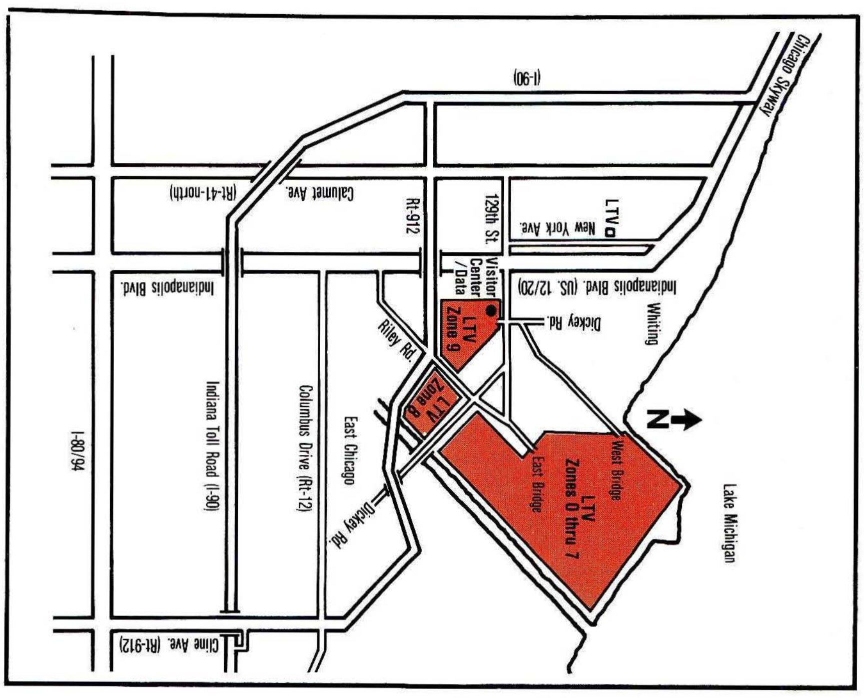
894 No. 2 C.R.S.M. Anneal
896 No. 2 C.R.S.M. Anneal

ZONE 9

900 Data - Visitor Registration
902 Physical's Clinic - Men
904 Physical's Clinic - Women
905 Data Entrance (Employee Only)
906 Mail Driver Entrance
908 No. 2 Tin Mill Portable Annealing Department

966 No. 2 Tin Mill Cleaner, Chrome, Annealing Department
968 No. 2 Tin Mill Cleaner/Chrome Line
970 No. 2 Tin Mill Portable Anneal
972 No. 2 Tin Mill Portable Anneal Department
974 No. 2 Tin Mill 138 KV Sub Station South Door
976 No. 2 Tin Mill 138 KV Sub Station North Door





LTV Steel

3001 Dickey Road
East Chicago, IN 46312

REV. 6/90

LTV Steel

INDIANA HARBOR WORKS

Station Location Map

Welcome to LTV Steel's Indiana Harbor Works. This map will assist you in finding the location of your destination.

The Works has been divided into 10 zones. Stations within these zones (0 thru 9) have been assigned 3 digit numbers. Station locations are identified by a posted sign like the example below.

LTV Steel
Station
072
Blast Furnace Warehouse Receiving

Zone Station Number

If you have trouble finding a station, please use a nearby phone and call this number for help: extension 3267. Please travel safely and obey all traffic signs when in the Works.

842 FRFC (2SM) Olson Heater Room
844 FRFC (2SM) Cold Roll Warehouse — North
846 FRFC (2SM) Cold Roll Warehouse Depressed Track
848 FRFC (2SM) Cold Roll Warehouse Depressed Track
850 FRFC (2SM) Cold Roll Warehouse Depressed Track
852 FRFC (2SM) Cold Roll Warehouse Depressed Track
854 FRFC (2SM) Cold Roll Warehouse Depressed Track — South
856 FRFC (2SM) Cold Roll Warehouse — South

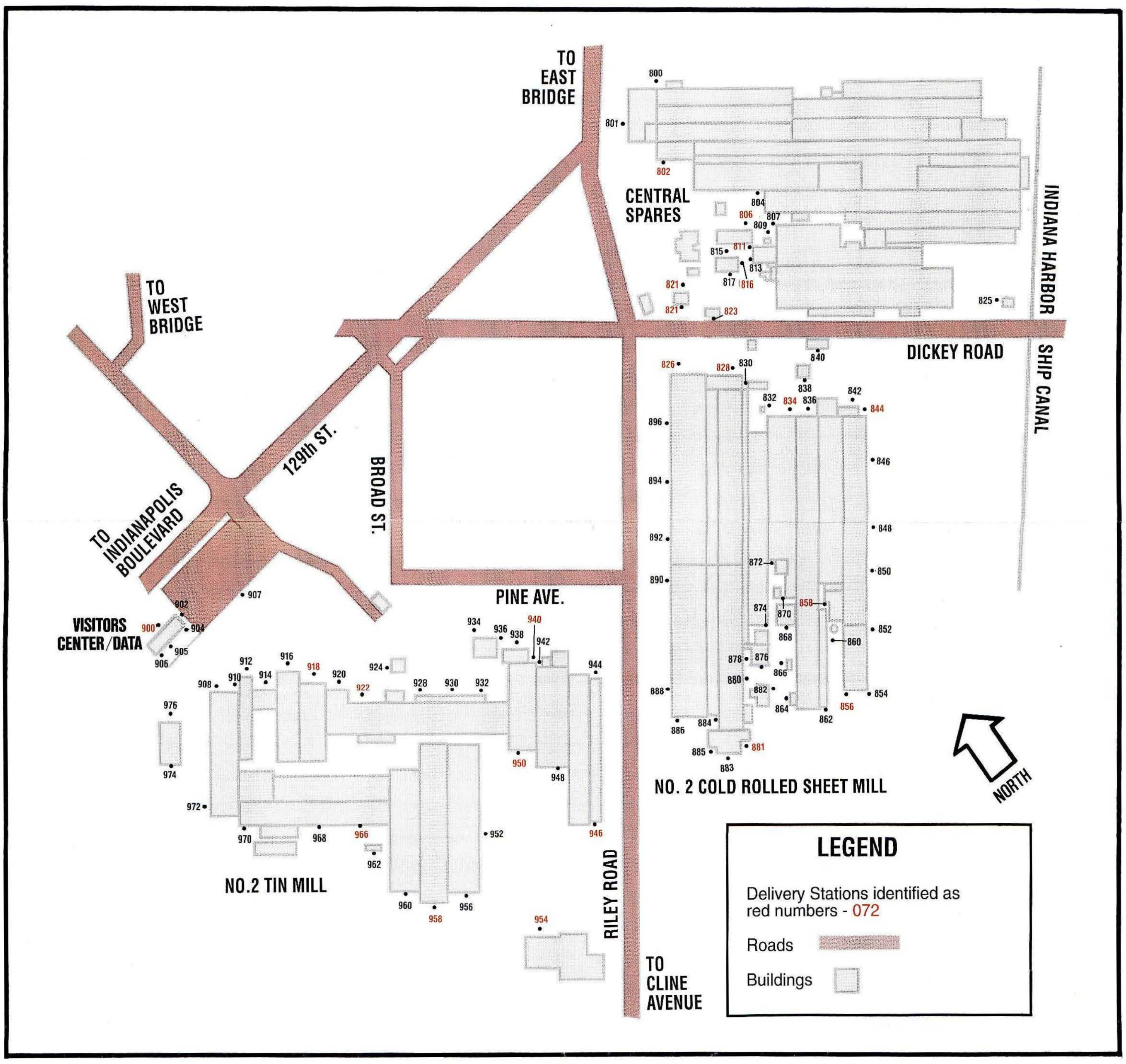
Door
894 FRFC (2SM) Anneal
896 FRFC (2SM) Anneal

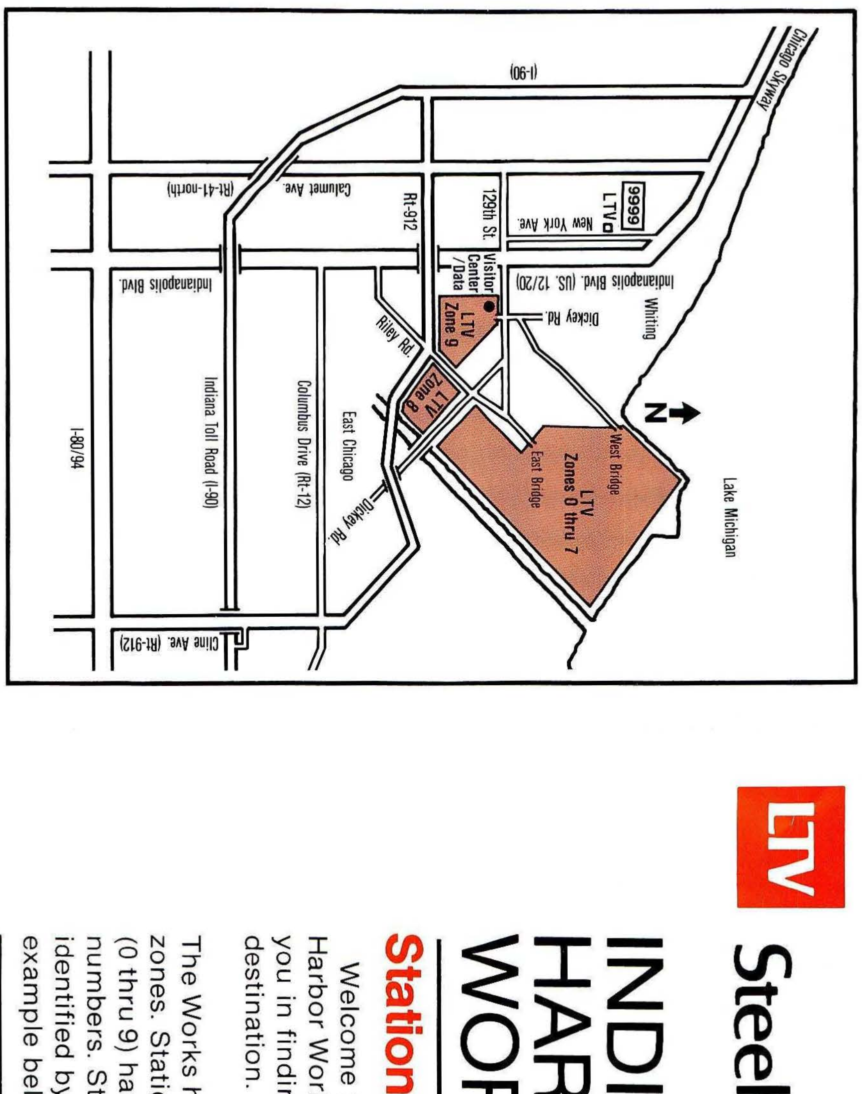
ZONE 9

900 Data - Visitor Registration
902 Physical's Clinic - Men
904 Physical's Clinic - Women
905 Data Entrance (Employee Only)
906 Mail Driver Entrance
907 Contractor Badge Reading Station – Flat Roll
908 No. 2 Tin Mill Portable Annealing Department
910 No. 2 Tin Mill Portable Anneal

Department
968 No. 2 Tin Mill Cleaner/Chrome Line
970 No. 2 Tin Mill Portable Anneal
972 No. 2 Tin Mill Portable Anneal Department
974 No. 2 Tin Mill 138 KV Sub Station South Door
976 No. 2 Tin Mill 138 KV Sub Station North Door

9999 (at New York Ave.) Personal Service, I.S.G., Tin Headquarters, Training, Internal Auditing
Located on Back Panel Map





LTV Steel

3001 Dickey Road
East Chicago, IN 46312

8/94

LTV Steel

INDIANA HARBOR WORKS

Station Location Map

Welcome to LTV Steel's Indiana Harbor Works. This map will assist you in finding the location of your destination.

The Works has been divided into 10 zones. Stations within these zones (0 thru 9) have been assigned 3 digit numbers. Station locations are identified by a posted sign like the example below.

LTV Steel
Station 072
Blast Furnace Warehouse Receiving

Zone Station Number

If you have trouble finding a station, please use a nearby phone and call this number for help: extension 3267. Please travel safely and obey all traffic signs when in the Works.

LTV Steel

Station Location Map Zones 0-7

ZONE 0

000 Indiana Harbor Works
001 Main Office
002 Security Department
004 Building Maintenance
007 Iron Foundry
008 Paint Shop
010 Steel Plant Carpenter Shop
013 Locomotive Shop
015 No. 1 O.H. Sub Station
016 Iron Foundry
017 Iron Foundry Office
018 Iron Foundry
020 Utilities Maintenance
022 Utilities Superintendent's Complex
024 Chemical Services
025 Flat Roll Chem Lab
026 Chemical Services/Safety Dept./ Environmental Control
027 Utilities Power House
029 Blast Furnace Welfare
030 Utilities Boiler House
031 Utilities – Operating
033 B.F. Yardmaster's Office
034 B.F. H-1 Furnace Sub-Station
035 Utilities – Boiler House Men's Welfare
036 B.F. Sinter Plant Office
038 B.F. Ore Dock Office South
039 B.F. Sinter Plant
040 B.F. Recirculation Plant
042 B.F. Maintenance Office
044 B.F. Tool Room
045 Utilities #7 Boiler
046 Utilities #5 Boiler
047 Utilities #3 Boiler
048 Utilities Pump House
049 Utilities Water Treating
050 Blast Furnace H-1 and H-2 Furnace
052 B.F. H-2 Furnace
054 B.F. Oiler Shanty
056 B.F. Motor Inspectors
057 B.F. Millwrights
060 B.F. H-3 Furnace
062 B.F. H-3 Furnace Sub-Station
064 B.F. H-3 and H-4 Pump House
065 Blast Furnace Electrical Parts
066 B.F. Ladle Repair
067 B.F. H-3 Computer Building
068 B.F. Pump Repair
070 B.F. Furnace Warehouse
072 B.F. Warehouse Receiving
074 B.F. Labor Office
076 B.F. Safety Office
078 B.F. Warehouse
080 B.F. H-4 Furnace
082 B.F. H-4 Furnace Sub-Station
084 B.F. No. 5 Sub-Station
086 B.F. Ore Dock Office North
088 B.F. Barge Dock Office
090 Utilities No. 1 Pump House
092 Blast Furnace Warehouse Annex
094 B.F. Warehouse North
096 Blast Furnace Superintendent's Complex

ZONE 1

100 Machine Shop Southwest
102 Maintenance Services & Strategies Central Maintenance Machine Shop Offices
104 Machine Shop
106 Machine Shop Warehouse South
108 Electric Shop
110 Machine Shop North
112 Field Maintenance
114 Machine Shop East Welfare
116 M.S. Southeast
118 M.S. Warehouse North
120 Electrical Maintenance Superintendent's Complex
121 Pipe Shop
124 Bull Gang
127 Line Shop
128 Electrical Testing
129 Line Shop-North
130 EIRTS Building
133 Bridge Shop Field Office
136 Fabricating and Weld Shop South
139 Fabricating and Weld Shop West
142 Refrigeration Shop
145 Fabricating and Weld Shop North
150 Brick Storage Area

ZONE 2

200 Mobile Equipment Repair
202 Mobile Equipment Repair
206 Transportation Services Switch Man's Welfare
208 Labor Dept. Storage
210 Transportation Services Superintendent's Complex
215 Maintenance Services & Strategies Purchased Services Group
220 Computer Process Control
230 R.R. Car Repair
232 Fabrication & Painting
240 Transportation Services Railroad Operations
244 11 Storage Shanty
245 Heckett Engineering
250 Crane Repair Receiving
260 Utilities Merchant Mill Oil House

ZONE 3

300 Motor Pool
305 Fire Prevention
307 Fire Prevention Receiving
310 Motor Pool Welfare
315 Environmental Lab
320 Rail & Yard Services
326 No. 8 Lift Station
330 Maintenance Services & Strategies TPM Group Mason Dept.
331 Maintenance Services & Strategies Janitorial Services Group
335 Mason Dept. & Steel Producing Material Storage
340 Steel Producing Ladle Cover Repair
341 Refractory Repair Area
342 #2 O.H. Mold Yard East End
344 #2 O.H. Mold Yard West End
346 #2 O.H. West End
350 No. 2 Slabber Stripper Office
352 Slab Dimensioning RTV Door East
353 Slab Dimensioning No. 1 & No. 2 Pit
354 Slab Dimensioning Dross Line Pulpit
355 Slab Dimensioning Welfare Building
360 Slab Dimensioning No. 3 & No. 4 Pit
363 Slab Dimensioning RTV Door West
365 Electrical Testing P.C.B. Storage
370 No. 2 Slabber No. 2 Slab Yard
375 No. 2 Slabber No. 3 Slab Yard — West
380 No. 2 Slabber No. 3 Slab Yard — East
385 No. 2 Slabber Slab Conditioning Office
390 Slab Conditioning/NDT
392 IMS – International Mill Services, Inc.
395 Quality Control Primary Met Lab

ZONE 4

400 Steel Producing Superintendent's Complex
402 S.P. Receiving
405 S.P. LMF Bag House
408 S.P. LMF Water Treatment Facility
410 S.P. BOF Bosch Tank Drain Classifier
411 BOF Pouring Pit — East
414 S.P. BOF Material Storage Area
416 Trans. Services (Caboose)
417 Utilities Terminal Lagoon Treatment Facility (M.S.D.)
420 Steel Producing BOF Hopper House
423 S.P. BOF Precipitator Bag House
426 S.P. BOF Material Receiving
429 S.P. BOF Electrical Sub-Station East End
432 S.P. BOF Precipitator
435 S.P. BOF Scrap Yard
438 S.P. BOF Maintenance West End
441 S.P. BOF Teeming Aisle West End
443 BOF Pit Office
444 S.P. BOF Teeming Aisle South End
445 S.P. Caster Bag House
447 S.P. Caster Tundish Yard East End
450 S.P. Caster Tundish Yard West End
453 S.P. Caster Maintenance West End
456 S.P. Caster Slab Shipping
462 S.P. Caster Water Treatment Facility
465 S.P. Scrap Handling
467 Caster/LMF Bus Stop
468 S.P. LMF Reline Area
470 S.P. Caster South Entrance
471 S.P. LMF Building
480 Levy Co. Shop Bldg.
482 Oil Technology, Inc.
490 Utilities - Foamite Bldg.
492 Utilities - Oil House
496 Utilities - Oil Barge Dock

ZONE 5

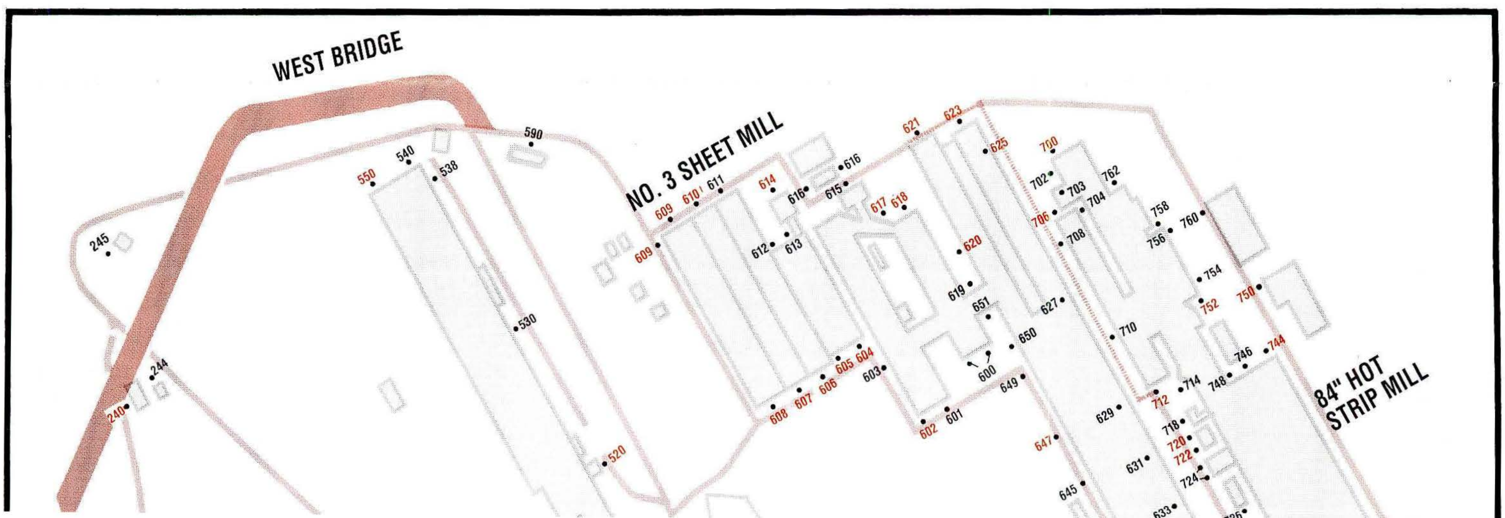
500 Utilities No. 2 Pump House
502 Utilities No. 2 Pump House
510 Steel Plant Paint Shop
520 Steel Plant Hospital
530 No. 9 Lift Station
538 Contractoring Badge Reading Station – Steel Plant
540 Engineering Storage Area
550 Steel Producing Spares Annex
590 West Bridge Truck Scale

ZONE 6

600 FRFR (3SM) Tandem Mill Motor Room
601 FRFR (3SM) H.N.X. Building
602 FRFR (3SM) Anneal Receiving
603 Anneal Softcoil Storage
604 FRFR (3SM) Anneal Soft Coil Storage
605 FRFR (3SM) Maintenance Receiving
606 FRFR (3SM) Finishing Bldg. No. 9 East End/Receiving/Shipping
607 FRFR (3SM) Finishing Bldg. No. 10 East End/Receiving Shipping
608 FRFR (3SM) Warehouse Shipping East End
609 FRFR (3SM) Warehouse Shipping West End
610 FRFR (3SM) Finishing Bldg. No. 10 West End/Receiving/Shipping
611 FRFR (3SM) Finishing Bldg. No. 9 West End/Receiving/Shipping
612 FRFR (3SM) Temper Mill
613 FRFR (3SM) Building No. 7 West End
614 FRFR (3SM) Superintendent's Office
615 FRFR (3SM) Men's Welfare Building
616 FRFR (3SM) Outdoor Sub-Station North End & South End
617 FRFR (3SM) Light Truck Receiving
618 FRFR (3SM) Tandem Mill Roll Shop Receiving
619 FRFR (3SM) Tandem Mill Oil Receiving
620 FRFR (3SM) Pickle Line Acid Receiving
621 FRFR (3SM) Pickle Line Receiving/ Shipping
623 Hot Strip Finishing Coil Storage West End
625 Hot Strip Finishing Coil Storage
627 Hot Strip Finishing Coil Storage
629 Hot Strip Finishing O.L.T.M.
631 Hot Strip Finishing Shear Line
633 H.S.F. Slitter Line
635 H.S.F. Tractor Repair
637 H.S.F. Maintenance Receiving
639 H.S.F. Warehouse
641 H.S.F. Warehouse Shipping
643 H.S.F. Warehouse Shipping
645 H.S.F. Warehouse Shipping
647 H.S.F. Warehouse Receiving/Shipping
649 FRFR (3SM) Pickle Line Coil Storage
651 No. 3 Cold Roll Sheet Mill Pickle Line Office
650 Pickle Line Delivery End
651 No. 3 Cold Roll Sheet Mill Pickle Line Office

ZONE 7

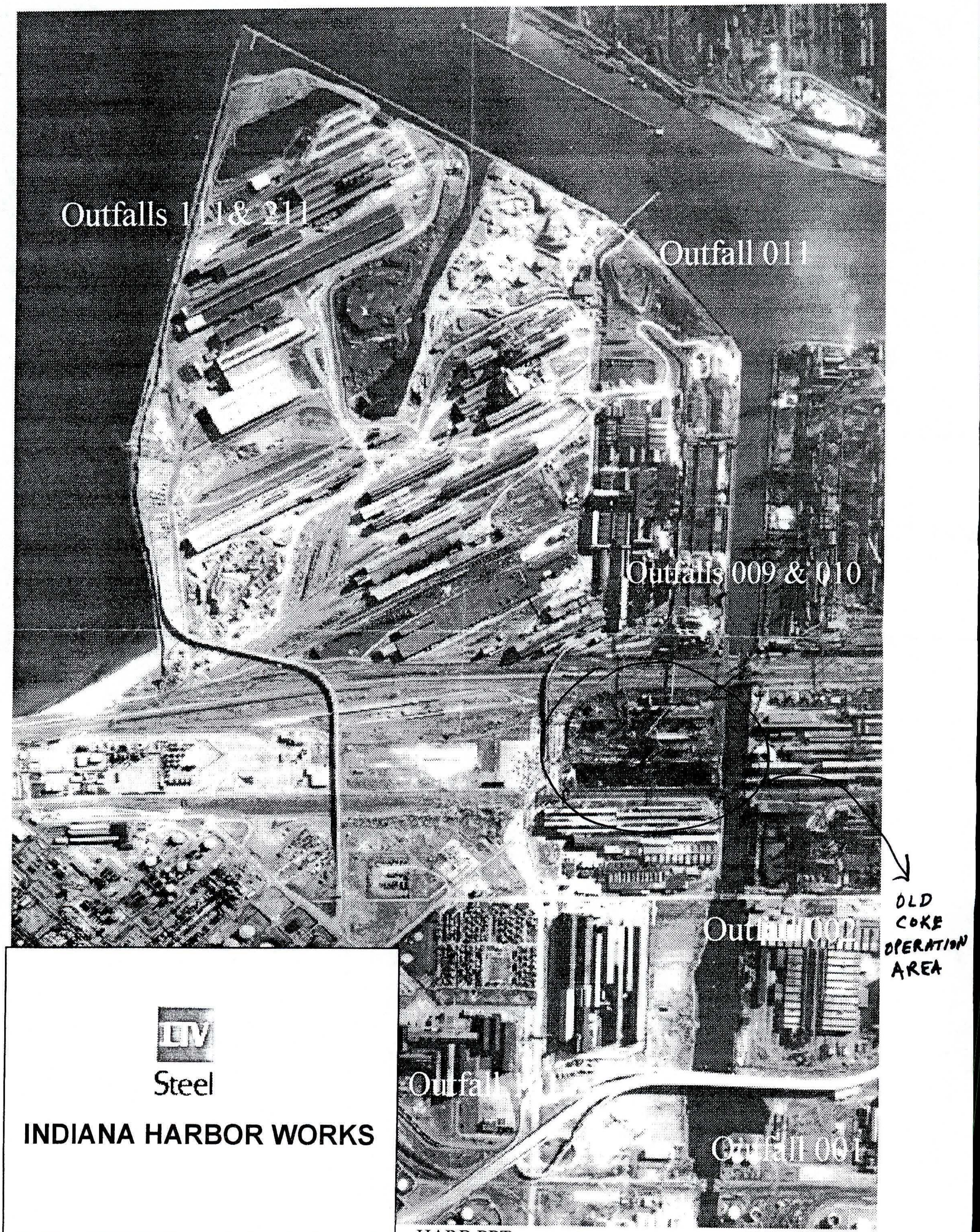
700 Hot Strip Coiler Maintenance
702 H.S. Mill Visitor's Exit
703 H.S. Coil Handling Tractor Doors
704 H.S. Runout Table
706 H.S. Roll Shop Receiving/Shipping
708 H.S. Roll Shop Roll Rack Area
710 H.S. Roll Shop Bearing Area
712 H.S. Maintenance Area Receiving/Shipping
714 H.S. Mill Building Roughing Mill Door
718 H.S. Computer Room
720 H.S. Superintendent Complex
722 H.S. Production Control Complex
724 H.S. Men's Welfare Building
726 H.S. No. 1 Scale Pit
728 H.S. Mill Visitor's Entrance
730 H.S. Pump House
732 H.S. Mill Building East End
734 H.S. Furnace Basement
736 H.S. Flat Roll Shops Pipe & Bridge
737 H.S. Slab Carrier Systems
738 H.S. Slab Yard East End
740 H.S. Slab Yard East End
742 H.S. No. 3 Pump House
744 H.S. Slab Yard West End
746 H.S. Slab Yard West End
748 H.S. Motor Room R-5 Area
750 H.S. Waste Water Treatment
752 H.S. Electrical Spare Parts Receiving/Shipping
754 H.S. M.G. House
756 H.S. M.G. House Truck Ramp
758 H.S. Vent Room
760 H.S. Sub-Station No. 4
762 H.S. Motor Room West End



23 FEB 2000

LTV INDIANA HARBOR WORKS.
RCRA Corrective Action Meeting

M. J. Thomas	LTV	219 391-284
Ruth Williams	IDEM	317 308 3083
Chris L. Myer	IDEM	317-233-4625
Demaree Collier	Tech Law	312-345-8971
Terry Uecker	TechLaw	312-345-8974
Jonathan ~~Adenuga~~	EPA	(312) 886-7954
Alan Cross	LTV	219-391-2330
Mike Sickels	IDEM	(317) 232-3406



HARB.PPT

JWF - 1997

BOF SHOP

LOCATION #2
BOF
TOTAL ZINC

Sample Number	Flow (gallons/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	993,563	6.440	53
2	757,914	4.380	28
3	371,941	1.410	4
4	313,134	3.300	9
5	1,606,679	3.250	44
6	1,376,426	5.560	64
7	2,785,001	1.270	30
8	640,942	7.200	39
$\bar{X}$	1,105,700	4.101	34
σ	815,950	2.201	21

BOF TRUNION COOLING WATER

LOCATION #6
BOF TRUNION COOLING WATER
TOTAL ZINC

Sample Number	MSD Influent Flow (gallons/day)	Terminal Lagoon Effluent Flow (gallons/day)	BOF Trunion Flow (gallons/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	31,680,000	26,738,696	4,941,304	0.0297	1
2	29,160,000	30,867,244	N/A	0.0262	N/A
3	31,680,000	32,726,783	N/A	0.0482	N/A
4	31,320,000	27,625,382	3,694,618	0.109	3
5	30,960,000	26,190,496	4,769,504	0.0484	2
6	30,427,200	27,270,901	3,156,299	0.0355	1
7	31,680,000	24,852,875	6,827,125	0.0423	2
8	33,480,000	27,768,369	5,711,631	0.0458	2
$\bar{X}$	31,298,400	28,005,093	4,850,080	0.0481	2
σ	1,233,054	2,565,110	1,331,899	0.0260	1

MISC. SHOP DISCHARGE

LOCATIONS #1 AND 2
COMBINED INTO LAGOON
TOTAL ZINC

Sample Number	Flow (gallons/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	20,605,889	N/A (2)	2,987 (3)
2	11,934,080	N/A	93
3	5,225,533	N/A	337
4	15,912,009	N/A	440
5	16,053,127	N/A	138
6	20,045,087	N/A	332
7	21,796,335	N/A	823
8	15,743,744	N/A	656
$\bar{X}$	15,914,476	N/A	403 (3)
σ	5,395,938	N/A	264 (3)

TERMINAL LAGOON

LOCATION #3
TERMINAL LAGOON EFFLUENT
TOTAL ZINC

Sample Number	Flow (gallons/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	26,738,696	1.190	266
2	30,867,244	0.940	242
3	32,726,783	1.140	312
4	27,625,382	1.500	346
5	26,190,496	0.915	200
6	27,270,901	1.120	255
7	24,852,875	1.460	303
8	27,768,369	1.640	381
$\bar{X}$	28,005,093	1.238	288
σ	2,565,110	0.267	59

TOTAL ZINC REMOVAL EFFICIENCIES
THROUGH TERMINAL LAGOON

Sample Number	Total Zinc Into Lagoons (pounds/day)	Total Zinc Out of Lagoon (pounds/day)	Removal %
1	2,987 (3)	266	91.09 (5)
2	93	242	N/A
3	337	312	7.42
4	440	346	21.36
5	138	200	N/A
6	332	255	23.19
7	823	303	63.18
8	656	381	41.92
$\bar{X}$	403 (3)	288	31.41 (5)
σ	264 (3)	59	21.59 (5)

LOCATION #4
MSD INFLUENT
TOTAL ZINC

Sample Number	Flow (gallons/day	Concentration (milligrams/liter)	Loading (pounds/day)
1	31,680,000	0.810	214
2	29,160,000	0.651	159
3	31,680,000	0.947	251
4	31,320,000	0.912	239
5	30,960,000	0.602	156
6	30,427,200	0.737	187
7	31,680,000	1.080	286
8	33,480,000	1.140	319
$\bar{X}$	31,298,400	0.860	226
σ	1,233,054	0.195	59

MSD FILTER PLANT

LOCATION #7
OUTFALL 011
TOTAL ZINC

Sample Number	Flow (4) (gallons/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	31,680,000	0.0963	25
2	29,160,000	0.197	48
3	31,680,000	0.350	93
4	31,320,000	0.195	51
5	30,960,000	0.404	105
6	30,427,200	0.372	95
7	31,680,000	0.360	95
8	33,480,000	0.174	49
$\bar{X}$	31,298,400	0.269	70
σ	1,233,054	0.115	30

TOTAL ZINC REMOVAL EFFICIENCIES THROUGH
MSD FILTER PLANT AND OVERALL EFFICIENCIES FROM TERMINAL
LAGOON THROUGH OUTFALL 011

Sample Number	Total Zinc Into MSD (pounds/day)	Total Zinc Out Outfall 011 (pounds/day)	Removal %	Overall %
1	214	25	88.32	98.96 (5)
2	159	48	69.81	N/A
3	251	93	62.95	65.70
4	239	51	78.66	83.22
5	156	105	32.69	N/A
6	187	95	49.20	60.98
7	286	95	66.78	87.77
8	319	49	84.64	91.08
$\bar{X}$	226	70	66.63	77.75 (5)
σ	59	30	18.59	13.55 (5)

Outfall 011

TO INDIANA HARBOR SHIP CANAL

BLAST FURNACES / BOILER HOUSE

LOCATION #1
BLAST FURNACE
TOTAL ZINC

Sample Number	Flow (gallons/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	19,612,326	17.900 (1)	2,934 (1)
2	11,176,166	0.700	65
3	4,853,592	8.210	333
4	15,598,875	3.310	431
5	14,446,448	0.781	94
6	18,668,661	1.720	268
7	19,011,334	4.990	793
8	15,102,802	4.890	617
$\bar{X}$	14,808,776	3.514 (1)	372 (1)
σ	4,910,307	2.732 (1)	266 (1)

(1) The concentration and loading for Sample #1 of the Blast Furnace were excluded in mean and standard deviation calculations.

(2) N/A - Not applicable.

(3) The combined loading from Locations #1 and #2 for Sample #1 were excluded in mean and standard deviation calculations.

(4) Used MSD Influent as Outfall 011 Effluent.

(5) Sample #1 removal efficiency was excluded in mean and standard deviation calculations.

REVISIONS

DESIGNED PAA
DRAWN SZM
CHECKED EWB
REVIEWED
S.O. 16666-01-S11

LTV STEEL CO.

BAKER / TSA, INC.
MERRILLVILLE, INDIANA.

Baker/TSA, Inc.

STUDY OF ZINC THRU OUTFALL 011

SCALE —

DATE 4-26-1989

SHEET NO.
FIGURE 5

BOF SHOP

MISC. SHOP DISCHARGE

BLAST FURNACES / BOILER HOUSE

BOF TRUNION COOLING WATER

TERMINAL LAGOON

MSD FILTER PLANT

LOCATION #2
BOF
SUSPENDED ZINC AND DISSOLVED ZINC

Sample Number	Flow (gallons/day)	Suspended Zinc: Concentration (milligrams/liter)	Suspended Zinc: Loading (pounds/day)	Dissolved Zinc: Concentration (milligrams/liter)	Dissolved Zinc: Loading (pounds/day)
1	993,563	6.410	53	0.0338	<1
2	757,914	4.340	27	0.0384	<1
3	371,941	1.270	4	0.136	<1
4	313,134	3.130	8	0.173	<1
5	1,606,679	3.090	41	0.161	2
6	1,376,426	5.330	61	0.318	4
7	2,785,001	1.100	26	0.172	4
8	640,942	7.100	38	0.0965	1
X̄	1,105,700	3.971	32	0.141	2
σ	815,950	2.228	20	0.091	1

LOCATION #2
BOF
pH VERSUS % DISSOLVED ZINC TO TOTAL ZINC

Sample Number	pH	%
1	11.48	0.52
2	10.36	0.88
3	9.82	9.65
4	9.23	5.24
5	9.86	4.95
6	9.39	5.72
7	9.39	13.54
8	9.32	1.34
X̄	9.86	5.23
σ	0.76	4.55

LOCATION #6
BOF TRUNION COOLING WATER
SUSPENDED ZINC AND DISSOLVED ZINC

Sample Number	Flow (gallons/day)	Suspended Zinc: Concentration (milligrams/liter)	Suspended Zinc: Loading (pounds/day)	Dissolved Zinc: Concentration (milligrams/liter)	Dissolved Zinc: Loading (pounds/day)
1	4,941,304	<0.0100	<1	0.0297	1
2	N/A	<0.0100	N/A	0.0248	N/A
3	N/A	0.0155	N/A	0.0327	N/A
4	3,694,618	0.0946	3	0.0144	<1
5	4,769,504	0.0314	1	0.0170	1
6	3,156,299	<0.0100	<1	0.0355	1
7	6,827,125	0.0264	2	0.0159	1
8	5,711,631	0.0319	2	0.0139	1
X̄	4,850,080	0.0287	2	0.0230	1
σ	1,331,899	0.0283	1	0.0088	0

LOCATION #6
BOF TRUNION COOLING WATER
pH VERSUS % DISSOLVED ZINC TO TOTAL ZINC

Sample Number	pH	%
1	8.04	100.00
2	8.00	94.66
3	8.10	67.84
4	8.22	13.21
5	8.16	35.12
6	8.08	100.00
7	7.94	37.59
8	8.10	30.35
X̄	8.08	59.85
σ	0.09	35.16

LOCATION #4
MSD INFLUENT
SUSPENDED ZINC AND DISSOLVED ZINC

Sample Number	Flow (gallons/day)	Suspended Zinc: Concentration (milligrams/liter)	Suspended Zinc: Loading (pounds/day)	Dissolved Zinc: Concentration (milligrams/liter)	Dissolved Zinc: Loading (pounds/day)
1	31,680,000	0.775	205	0.0347	9
2	29,160,000	0.562	137	0.0892	22
3	31,680,000	0.854	226	0.0933	25
4	31,320,000	0.886	232	0.0262	7
5	30,960,000	0.559	145	0.0431	11
6	30,427,200	0.673	171	0.0639	16
7	31,680,000	1.040	275	0.0410	11
8	33,480,000	1.070	299	0.0711	20
X̄	31,298,400	0.802	211	0.0578	15
σ	1,233,054	0.197	59	0.0253	7

LOCATION #4
MSD INFLUENT
pH VERSUS % DISSOLVED ZINC TO TOTAL ZINC

Sample Number	pH	%
1	8.61	4.28
2	8.25	13.70
3	8.44	9.85
4	8.59	2.87
5	8.30	7.16
6	8.02	8.67
7	8.02	3.80
8	7.92	6.24
X̄	8.27	7.07
σ	0.27	3.61

LOCATIONS #1 AND #2
COMBINED INTO LAGOON
SUSPENDED ZINC AND DISSOLVED ZINC

Sample Number	Flow (gallons/day)	Suspended Zinc: Concentration (milligrams/liter)	Suspended Zinc: Loading (pounds/day)	Dissolved Zinc: Concentration (milligrams/liter)	Dissolved Zinc: Loading (pounds/day)
1	20,605,889	N/A (2)	2,938 (3)	N/A	46
2	11,934,080	N/A	84	N/A	9
3	5,225,533	N/A	317	N/A	20
4	15,912,009	N/A	421	N/A	18
5	16,053,127	N/A	122	N/A	16
6	20,045,087	N/A	303	N/A	30
7	21,796,335	N/A	801	N/A	21
8	15,743,744	N/A	638	N/A	18
X̄	15,914,476	N/A	384 (3)	N/A	22
σ	5,395,938	N/A	261 (3)	N/A	11

LOCATION #3
TERMINAL LAGOON EFFLUENT
SUSPENDED ZINC AND DISSOLVED ZINC

Sample Number	Flow (gallons/day)	Suspended Zinc: Concentration (milligrams/liter)	Suspended Zinc: Loading (pounds/day)	Dissolved Zinc: Concentration (milligrams/liter)	Dissolved Zinc: Loading (pounds/day)
1	26,738,696	1.150	257	0.0384	9
2	30,867,244	0.858	221	0.0821	21
3	32,726,783	0.950	260	0.188	51
4	27,625,382	1.450	335	0.0475	11
5	26,190,496	0.843	185	0.0722	16
6	27,270,901	0.940	214	0.180	41
7	24,852,875	1.200	249	0.262	54
8	27,768,369	1.050	244	0.587	136
X̄	28,005,093	1.055	246	0.182	42
σ	2,565,110	0.205	44	0.182	42

LOCATION #3
TERMINAL LAGOON EFFLUENT
pH VERSUS % DISSOLVED ZINC TO TOTAL ZINC

Sample Number	pH	%
1	8.58	3.23
2	8.16	8.73
3	8.36	16.49
4	8.40	3.17
5	8.18	7.89
6	7.90	16.07
7	7.93	17.95
8	7.83	35.79
X̄	8.17	13.67
σ	0.27	10.68

LOCATION #7
OUTFALL 011
SUSPENDED ZINC AND DISSOLVED ZINC

Sample Number	Flow(4) (gallons/day)	Suspended Zinc: Concentration (milligrams/liter)	Suspended Zinc: Loading (pounds/day)	Dissolved Zinc: Concentration (milligrams/liter)	Dissolved Zinc: Loading (pounds/day)
1	31,680,000	0.0674	18	0.0289	8
2	29,160,000	0.122	30	0.0751	18
3	31,680,000	0.254	67	0.0940	25
4	31,320,000	0.118	31	0.0773	20
5	30,960,000	0.322	183	0.0817	21
6	30,427,200	0.269	68	0.103	26
7	31,680,000	0.252	67	0.108	29
8	33,480,000	0.119	33	0.0554	16
X̄	31,298,400	0.190	50	0.0779	20
σ	1,233,054	0.094	24	0.0260	7

LOCATION #7
OUTFALL 011
pH VERSUS % DISSOLVED ZINC TO TOTAL ZINC

Sample Number	pH	%
1	8.31	30.01
2	7.80	38.12
3	8.04	26.86
4	7.98	39.64
5	7.88	20.22
6	7.72	27.69
7	7.75	30.00
8	7.89	31.84
X̄	7.92	30.55
σ	0.19	6.22

LOCATION #1
BLAST FURNACE
SUSPENDED ZINC AND DISSOLVED ZINC

Sample Number	Flow (gallons/day)	Suspended Zinc: Concentration (milligrams/liter)	Suspended Zinc: Loading (pounds/day)	Dissolved Zinc: Concentration (milligrams/liter)	Dissolved Zinc: Loading (pounds/day)
1	19,612,326	17.600 (1)	2,885 (1)	0.281	46
2	11,176,166	0.608	57	0.0925	9
3	4,853,592	7.720	313	0.490	20
4	15,598,875	3.170	413	0.141	18
5	14,446,448	0.667	81	0.114	14
6	18,668,661	1.550	242	0.166	26
7	19,011,334	4.880	775	0.108	17
8	15,102,802	4.750	600	0.137	17
X̄	14,808,776	3,335 (1)	354 (1)	0.191	21
σ	4,910,307	2,626 (1)	264 (1)	0.[illegible]34	11

LOCATION #1
BLAST FURNACE
pH VERSUS % DISSOLVED ZINC TO TOTAL ZINC

Sample Number	pH	%
1	7.19	1.57
2	7.49	13.21
3	7.75	5.97
4	7.60	4.26
5	7.54	14.60
6	7.49	9.65
7	7.54	2.16
8	7.54	2.80
X̄	7.52	6.78
σ	0.16	5.10

Outfall 011

TO
INDIANA HARBOR
SHIP CANAL

(1) The concentration and loading for Sample #1 of the Blast Furnace were excluded in mean and standard deviation calculations.

(2) N/A - Not applicable.

(3) The combined loading from Locations #1 and #2 for Sample #1 were excluded in mean and standard deviation calculations.

(4) Used MSD Influent as Outfall 011 Effluent.

(5) Sample #1 removal efficiency was excluded in mean and standard deviation calculations.

REVISIONS

DESIGNED PAA
DRAWN SZM
CHECKED EWB
REVIEWED
SO 16666-011-S11

LTV STEEL CO.

BAKER / TSA, INC.
MERRILLVILLE, INDIANA.

Baker Engineers
Baker/TSA, Inc.

STUDY OF ZINC THRU OUTFALL 011

SHEET NO.
FIGURE 6

SCALE —
DATE 4-26-1989

H | G | F | E | D | C | B | A

BOF SHOP

MISC. SHOP DISCHARGE

BLAST FURNACES/ BOILER HOUSE

BOF TRUNION COOLING WATER

TERMINAL LAGOON

MSD FILTER PLANT

LOCATION #2
BOF
TOTAL SUSPENDED SOLIDS AND TOTAL DISSOLVED SOLIDS

Sample Number	Flow (gallons/day)	Total Suspended Solids		Total Dissolved Solids	
		Concentration (milligrams/liter)	Loading (pounds/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	993,563	497	4,127	243	2,018
2	757,914	243	1,539	170	1,077
3	371,941	83	258	190	591
4	313,134	138	361	233	610
5	1,606,679	177	2,377	216	2,900
6	1,376,426	119	1,369	238	2,738
7	2,785,001	36	838	227	5,283
8	640,942	205	1,098	273	1,462
$\bar{X}$	1,105,700	187	1,496	224	2,085
σ	815,950	142	1,261	32	1,565

LOCATIONS #1 AND #2
COMBINED INTO LAGOON
TOTAL SUSPENDED SOLIDS AND TOTAL DISSOLVED SOLIDS

Sample Number	Flow (gallons/day)	Total Suspended Solids		Total Dissolved Solids	
		Concentration (milligrams/liter)	Loading (pounds/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	20,605,889	N/A[1]	123,446	N/A	65,775
2	11,934,080	N/A	13,120	N/A	41,612
3	5,225,533	N/A	12,102	N/A	13,368
4	15,912,009	N/A	21,740	N/A	44,280
5	16,053,127	N/A	17,468	N/A	46,000
6	20,045,047	N/A	27,735	N/A	59,527
7	21,796,335	N/A	20,856	N/A	64,385
8	15,743,744	N/A	53,981	N/A	50,685
$\bar{X}$	15,914,476	N/A	36,306	N/A	48,204
σ	5,395,938	N/A	37,623	N/A	16,828

LOCATION #1
BLAST FURNACE
TOTAL SUSPENDED SOLIDS AND TOTAL DISSOLVED SOLIDS

Sample Number	Flow (gallons/day)	Total Suspended Solids		Total Dissolved Solids	
		Concentration (milligrams/liter)	Loading (pounds/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	19,612,326	728	119,319	389	63,757
2	11,176,166	124	11,581	434	40,535
3	4,853,592	292	11,844	315	12,777
4	15,598,875	164	21,379	335	43,670
5	14,446,448	125	15,091	357	43,100
6	18,668,661	169	26,366	364	56,789
7	19,011,334	126	20,018	372	59,102
8	15,102,802	419	52,883	390	49,223
$\bar{X}$	14,808,776	268	34,810	370	46,119
σ	4,910,307	213	36,635	36	15,862

LOCATION #6
BOF TRUNION COOLING WATER
TOTAL SUSPENDED SOLIDS AND TOTAL DISSOLVED SOLIDS

Sample Number	Flow (gallons/day)	Total Suspended Solids		Total Dissolved Solids	
		Concentration (milligrams/liter)	Loading (pounds/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	4,941,304	8	330	164	6,772
2	N/A	10	N/A	156	N/A
3	N/A	7	N/A	187	N/A
4	3,694,618	6	185	187	5,774
5	4,769,504	<1	<40	191	7,613
6	3,156,219	2	53	202	5,328
7	6,827,125	1	57	186	10,612
8	5,711,631	<1	<48	193	9,212
$\bar{X}$	4,850,080	5	119	183	7,552
σ	1,331,899	4	117	15	2,042

LOCATION #3
TERMINAL LAGOON EFFLUENT
TOTAL SUSPENDED SOLIDS AND TOTAL DISSOLVED SOLIDS

Sample Number	Flow (gallons/day)	Total Suspended Solids		Total Dissolved Solids	
		Concentration (milligrams/liter)	Loading (pounds/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	26,738,696	25	5,586	378	84,466
2	30,867,244	23	5,933	358	92,348
3	32,726,783	27	7,384	378	103,382
4	27,625,382	43	9,927	356	82,188
5	26,190,496	39	8,536	397	86,892
6	27,270,901	23	5,242	369	84,096
7	24,852,875	32	6,646	397	82,455
8	27,768,369	24	5,569	377	87,486
$\bar{X}$	28,005,093	30	6,853	376	87,914
σ	2,565,110	8	1,661	15	7,063

TOTAL SUSPENDED SOLIDS REMOVAL EFFICIENCIES
THROUGH TERMINAL LAGOON

Sample Number	Total Suspended Solids Into Lagoon (pounds/day)	Total Suspended Solids Out of Lagoon (pounds/day)	Removal %
1	123,446	5,586	95.47
2	13,120	5,933	54.78
3	12,102	7,384	38.99
4	21,740	9,927	54.34
5	17,468	8,536	51.13
6	27,735	5,242	81.10
7	20,856	6,646	68.13
8	53,981	5,569	89.68
$\bar{X}$	36,306	6,853	66.70
σ	37,623	1,661	20.25

LOCATION #4
MSD INFLUENT
TOTAL SUSPENDED SOLIDS AND TOTAL DISSOLVED SOLIDS

Sample Number	Flow (gallons/day)	Total Suspended Solids		Total Dissolved Solids	
		Concentration (milligrams/liter)	Loading (pounds/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	31,680,000	14	3,706	266	70,423
2	29,160,000	26	6,336	308	75,056
3	31,680,000	17	4,501	340	90,014
4	31,320,000	17	4,450	340	88,991
5	30,960,000	10	2,587	363	93,919
6	30,427,200	12	3,051	335	85,183
7	31,680,000	17	4,501	365	96,633
8	33,480,000	9	2,518	334	93,450
$\bar{X}$	31,298,400	15	3,956	331	86,709
σ	1,233,054	5	1,272	32	9,376

LOCATION #7
OUTFALL 011
TOTAL SUSPENDED SOLIDS AND TOTAL DISSOLVED SOLIDS

Sample Number	Flow[4] (gallons/day)	Total Suspended Solids		Total Dissolved Solids	
		Concentration (milligrams/liter)	Loading (pounds/day)	Concentration (milligrams/liter)	Loading (pounds/day)
1	31,680,000	2	529	312	82,601
2	29,160,000	8	1,950	314	76,518
3	31,680,000	10	2,647	316	83,660
4	31,320,000	8	2,094	317	82,971
5	30,960,000	6	1,552	336	86,934
6	30,427,200	6	1,526	331	84,166
7	31,680,000	5	1,324	357	94,515
8	33,480,000	<1	280	322	90,093
$\bar{X}$	31,298,400	6	1,488	326	85,182
σ	1,233,054	3	787	15	5,402

TOTAL SUSPENDED SOLIDS REMOVAL EFFICIENCIES THROUGH
MSD FILTER PLANT AND OVERALL EFFICIENCIES FROM TERMINAL
LAGOON THROUGH OUTFALL 011

Sample Number	Total Zinc Into MSD (pounds/day)	Total Zinc Out Outfall 011 (pounds/day)	Removal %	Overall %
1	3,706	529	85.73	99.35
2	6,336	1,950	69.22	86.08
3	4,501	2,647	41.19	64.12
4	4,450	2,094	52.94	78.51
5	2,587	1,552	40.01	70.68
6	3,051	1,526	49.98	90.55
7	4,501	1,324	70.58	90.62
8	2,518	280	88.88	98.85
$\bar{X}$	3,956	1,488	62.32	84.85
σ	1,272	787	19.10	12.79

Outfall 011

TO
INDIANA HARBOR
SHIP CANAL

(1) N/A - Not applicable.

(2) Used MSD Influent as Outfall 011 Effluent.

REVISIONS

DESIGNED PAA
DRAWN SZM
CHECKED EWB
REVIEWED
S.O. 16666-011-S11

LTV STEEL CO.

BAKER / TSA, INC.
MERRILLVILLE, INDIANA.

Baker Engineers
Baker/TSA, Inc.

STUDY OF ZINC THRU
OUTFALL 011

SCALE —

DATE 4-26-1989

SHEET NO.
FIGURE
7

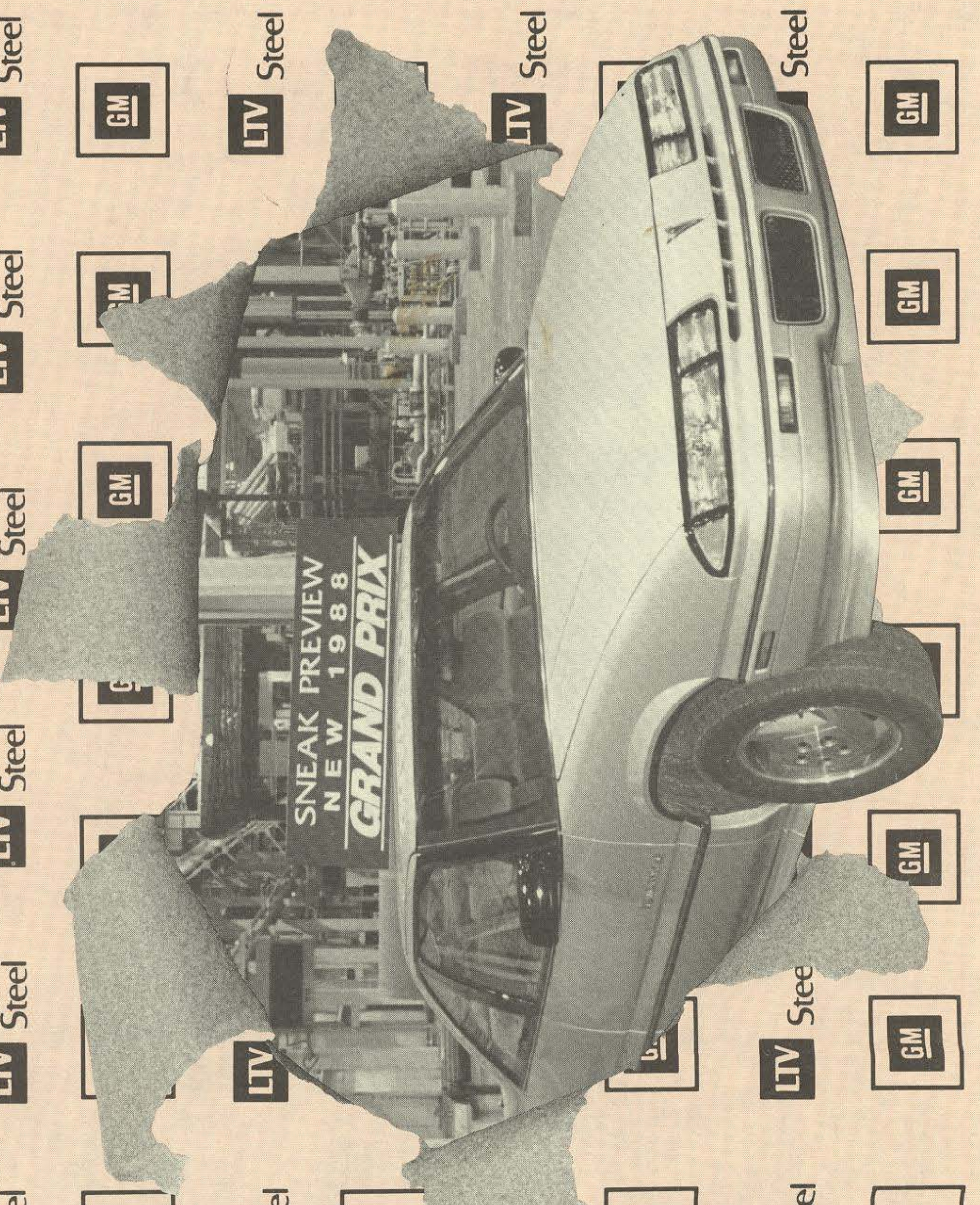
GM-LTV Steel Partnership
(see centerfold)

March 1988

Reporter

LTV Steel
A Publication for LTV Steel Employees

GRAND PRIX DELIVERS QUALITY MESSAGE TO LTV STEEL EMPLOYEES



BULK RATE
U.S. Postage
PAID
Permit No. 997
Cleveland, OH

LTV Steel
LTV Steel Building
25 West Prospect Avenue
Cleveland, Ohio 44115

Reporter

Joint team strives for continuous improvement

In keeping with the company's "Continuous Improvement" belief, LTV Steel proposed to General Motors that joint Continuous Improvement Teams (CITs) be created at all GM steel fabricating plants. The objective was to explore areas where quality improvements and cost reductions could be made, and to jointly develop and implement corrective action. CIT members would have authority to draw upon the resources of LTV Steel and GM to bring about meaningful change.

Last summer, Cleveland District sales manager Claude Gotthardt proposed the establishment of a CIT to William Burns, production manager of the Lordstown, Ohio, Buick-Oldsmobile-Cadillac (B-O-C) steel fabricating plant. LTV Steel's Cleveland and Warren plants currently supply Lordstown with steel products.

Based on the mutual benefits each company would receive, the proposal was accepted. CIT members began meeting on a regular basis during July.

Topics Selected

"After our initial brainstorming sessions, we made a list of eight topics for improvement," said Bill Sobey, LTV Steel salesman and team member.

The first item on the list was improvement of incoming coil packaging to minimize handling damage at the B-O-C plant. To tackle that specific issue, Cleveland Works personnel developed an Integrated Process Control (IPC) chart to monitor coil condition at #2 finishing cold roll shipping.

Called a "p-chart," it classifies the attributes of a product, determining if they are conforming or nonconforming. At #2 finishing cold roll shipping, a p-chart is maintained for coil storage and material condition.

Improved Coil Condition

Since the inception of this IPC tool last year, there has been a dramatic improvement in coil condition by the reduction in the daily percentage of nonconforming coils.

"During the first two months of 1987, the average percentage of coils observed as nonconforming in a daily bay audit was **26.3 percent**," stated John Bilecky, #2 finishing superintendent and CIT member. "This past summer, the average was reduced to **5.6 percent**!"

Four major changes were made at the shipping operation to achieve this improvement:

- Single row racks were installed with no space for coil storage between rows.
- The same racks were designed with "saddles," spaced so there would be no outside coil diameter contact between coils.
- Coil tongs were purchased to replace the "C" hooks previously used by the cranes to handle coils. This reduced inside coil diameter damage and other handling damage.
- Inventory levels in the building have been reduced for better coil storage control.

Cleveland plant shipping employee Paul Scuba prepares the p-chart, and recently made a presentation to the B-O-C/LTV Steel continuous improvement team. Members were pleased with the results of this successful IPC application and have made it part of an ongoing program to improve incoming coil packaging.

Plant Visitations

There have been several exchange visits between Cleveland and Warren employees and the GM people. These sessions have included hourly and salaried personnel, as well as a group of Cleveland Works management trainees.

"We aim for a good cross-section of attendees, so that employees get exposure to concerns and issues of both companies," Sobey commented.

The day-long Lordstown trips covered the fabricating plant, metal assembly plant and assembly line. During tours of the Lordstown plant, LTV Steel employees talked with B-O-C workers from steel receiving, unloading, stamping, fabricating and assembly. Lordstown produces "J" cars — specifically the Chevrolet Cavalier and Pontiac Sunbird models.

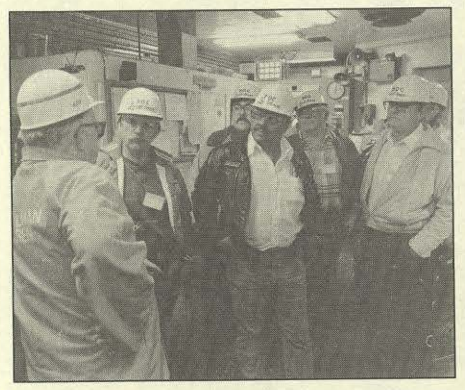
In turn, GM employees have made extensive tours of the primary, rolling and finishing operations at Cleveland and Warren. One auto worker noted that "this was the first time ever in a steel mill," and he had been working with steel products for 12 years. B-O-C employees were impressed with the massiveness and modern technology utilized in the steel plants. They were equally complimentary about LTV Steel's commitment to the IPC system.

Other LTV Steel employees on the team are Frank Celedonia, inside salesman; Pete D'Amico, metallurgical service engineer; Larry Hawkins, metallurgist; George Klems, automotive development engineer; and Jack Walter, public relations director. Representing the Lordstown plant are Meekyung Chung, salaried SPC coordinator-statistician; Lou Fronzaglio, steel buyer; Brian Maschgan, hourly SPC coordinator; Bill Meier, steel specification analyst; Tong Ha Rhee, metallurgist; and Ed Ross, inspector.

In 1987, B-O-C Lordstown produced 234,494 Chevrolet Cavaliers and Pontiac Sunbirds. The fabricating plant used more than 200,000 metric tons of steel to stamp major metal parts for seven GM vehicle lines, including Lordstown-built cars and vans. About 47 percent of the fabricating plant's stampings are used in Lordstown; the remaining output is shipped to 20 other GM assembly plants.

CORROSION TEST CAR AT B-O-C Lordstown is getting close attention from (front row, left to right): Bill Sobey, Cleveland DSO sales representative; Brian Maschgan, B-O-C hourly SPC coordinator; and Ron Kundla, Cleveland DSO assistant district sales manager. Also present on the tour were Jim Richardson, B-O-C security (left), and Ed Ross B-O-C steel performance inspector.

Buick · Oldsmobile · Cadillac Group
LORDSTOWN COMPLEX

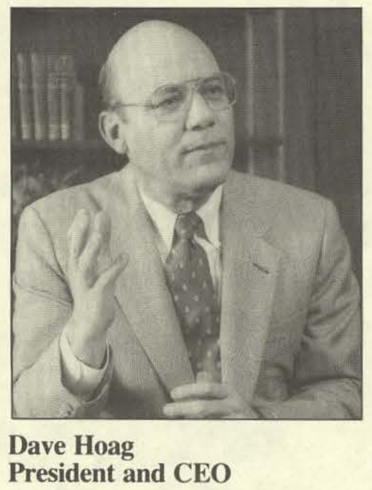


PAYING CLOSE ATTENTION to comments of Matt Blair, Warren BOF general supervisor, are B-O-C Lordstown employees who expressed interest in the high-tech skills, computers and equipment necessary to meet the high quality goals of the Warren BOF.

CLEVELAND WORKS employee Paul Scuba charts the daily percentage of nonconforming coils at #2 finishing. Interpreting this IPC data, changes were made at the shipping operation, resulting in dramatically improved coil condition.

B-O-C HOURLY SPC COORDINATOR Brian Maschgan (front, left) discusses quality programs with Warren visitors (rear, left to right): Leonard Grbinick, USWA Local 1375 representative; Tom White, supervisor-security; Willie Washington, anneal operator; and Eldred Davis, 54″ temper mill roller (front).

All Customers Are Important



Dave Hoag
President and CEO

This issue of the *Reporter* features the new Pontiac Grand Prix – *Motor Trend* magazine's "Car of the Year" – a major source of pride for LTV Steel. Our steel is prominent throughout the Grand Prix in critical exposed panel applications, as well as parts which are less visible. We've worked very hard to achieve the leadership position with our major customers, and we're proud to say we are succeeding. When we evaluate our quality and delivery performance, we usually measure it by how well we do at these large volume accounts. After all, by definition, they represent a substantial portion of our total shipments and revenue. We must be careful, however, not to fall into the trap of believing that as long as we satisfy these customers, we've done our jobs.

The fact is that each customer – large or small – expects and is entitled to 100 percent compliance to his requirements. If we've accepted the order, our responsibility is to find a way to deliver on those expectations and meet our promises.

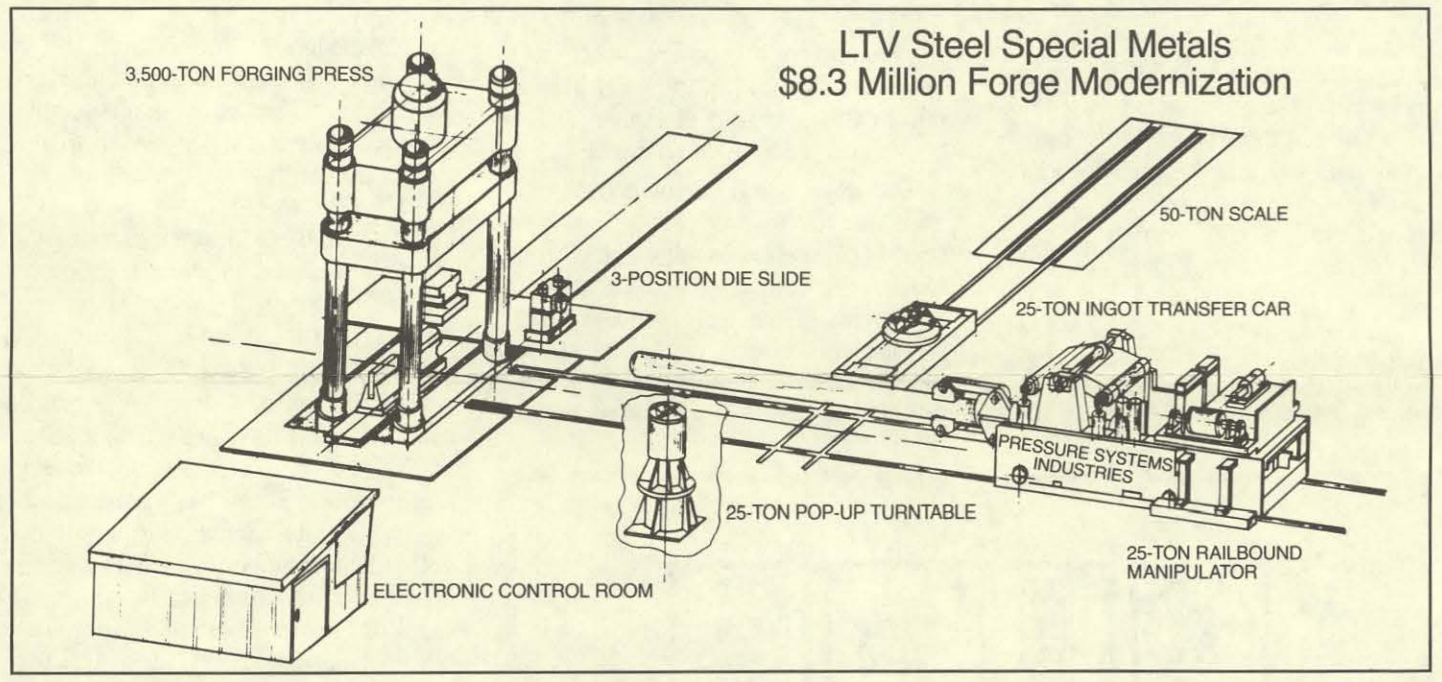
In many instances, the small customer's requirements may actually be more difficult to meet. For that reason, each phase of our production process has got to be right on the money in order for us to meet the expectations. If we miss a heat, we may have missed the entire order. Just one coil improperly rolled or damaged in handling, or delivered late, may represent a substantial shortfall against the ordered tonnage. And, we could be responsible for shutting our smaller customer down.

Even though the so-called small orders may occasionally require extra effort, they frequently provide opportunities for future growth. Our smaller customers have played a significant role in our continuous improvement by challenging our production capabilities. They are frequently on the leading edge of new products or technology. By bringing their ideas to us for further development and experimentation, they give us the opportunity to become part of the process of bringing new products to market. As a result, we have a continuing interest in that company's success, and we have likely established a new business partnership in the process.

The development of partnerships between LTV Steel and major end users is the result of earlier successful experiences with smaller companies, and product quality and delivery performance are key components of those relationships. In both of those areas we showed substantial improvement last year. We've made progress because we've placed customer satisfaction at the head of our priority list; because we have resources adequate for the task; and because we have control systems, such as IPC, to monitor our performance. We have earned customer trust and confidence by demonstrating that we are serious about striving toward their satisfaction 100 percent of the time.

Consistent with our mission and beliefs, there is no large or small customer. All customers are extremely important to LTV Steel's success. We must apply our business principles to 100 percent of our customers, 100 percent of the time.

Bar group gives investment update



DEPICTED IN THE ABOVE DRAWING are the major components of the forge press complex to be completed this summer.

The Bar Division continues to commit to the future. Two current capital projects are worthy of note.

Special Metals Forge Press

This $8.3 million project was announced last May, and is scheduled for completion at mid-year. The new forge press complex, including a robotic manipulator capable of handling a 50,000-lb. piece of steel, will be the most modern open-die forge complex in North America.

The modernization will enable the Special Metals plant to improve its efficiency as well as to provide a broader product range.

The project is well under way. An extension to the existing forge press building has been completed. All major components for the manipulator have been ordered, with many already received. The die slide is being fabricated.

Purchased components for the transfer car are on order with some items already received. Engineering for the turntable is complete, and quotation requests for fabrication and assembly have been issued. The new main cylinder and ram have been completed.

Pressure Systems, Inc. of Enon, Ohio, is the turnkey contractor, and the bulk of the equipment is being made in Ohio.

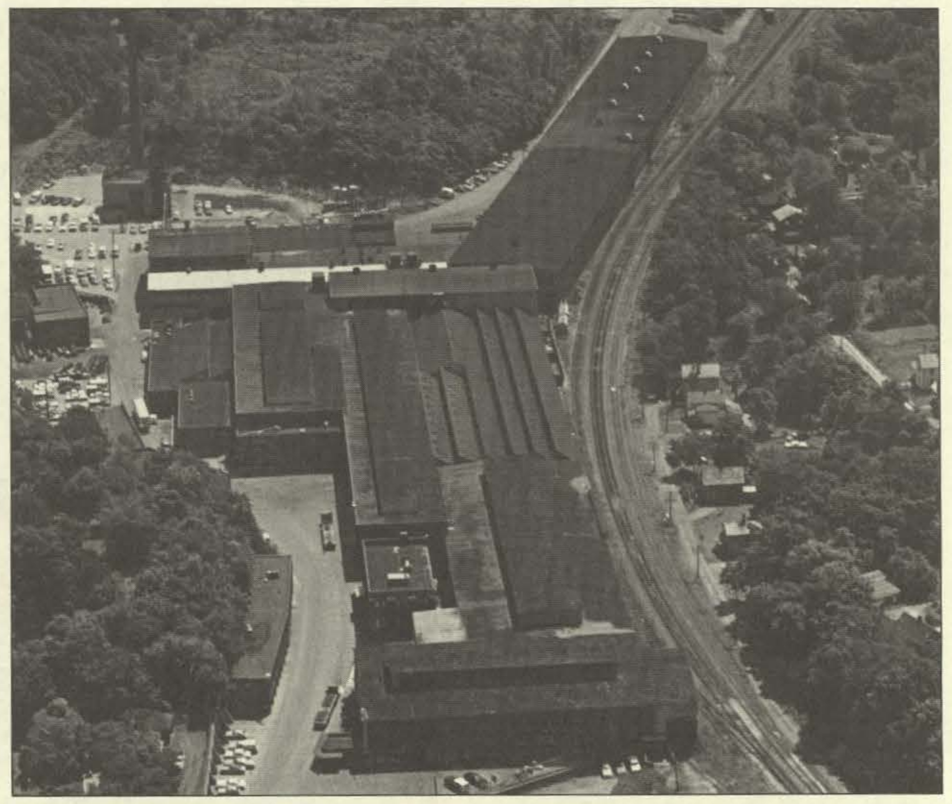
Everything is on schedule for a summer start-up. "This investment is a clear signal to our customers in the aircraft and aerospace industries that we intend to meet the market's needs for the future," said John Vaught, general manager of Special Metals.

Massillon Drawbench

This project, costing nearly $1 million, involves the removal of the 150,000-lb. drawbench and auxiliary equipment from the shut down Hammond cold finished plant, and relocating same to the Massillon plant. The project began late last year and should be completed during March.

Drawbench equipment at Hammond has been dismantled and transported to a facility in Ohio for cleaning and preparation for installation at Massillon. Required concrete foundation work at Massillon has been completed. The metalcut saw and rototesters have been relocated and are in operation. An existing 750 KVA substation has been relocated and installed as the power source for the drawbench line. Rehabilitation work on mechanical components of the drawbench line is being completed.

Installation will begin soon. When completely operational, the drawbench will increase Massillon's product capability and productivity. It represents a large step in this plant's efforts to secure its future. "We are anxious to see all the pieces in place and begin to familiarize ourselves with the equipment," said Bill Hunter, Massillon plant manager. "Getting this equipment bodes well for our customers and our future."



THE MASSILLON PLANT will greatly enhance its viability as a result of the soon to be completed $1 million drawbench project.

Reporter

A monthly newspaper for employees of LTV Steel
25 West Prospect Avenue Cleveland, Ohio 44115 Phone: (216) 622-4607

LTV Steel is a leader in the manufacture and sale of engineered steels for demanding applications. Our mission is to continually improve our products and services to satisfy our customers' requirements 100 percent of the time, and to achieve sufficient return on our investment to enable us to prosper as a company.

LTV STEEL NEWS FRONT

Beaver Falls manager gets recognition from Pentagon

Each year, the Defense Department's Committee for Employer Support of the National Guard and Reserves holds a nationwide competition to determine worthy recipients.

Bob Winn, manager of the Beaver Falls cold finished bar plant, was recently selected to receive the award. The Certificate of Appreciation was given to Winn for his contributions and support as an employer to the national defense efforts.

The selection process starts at the local level with an employee/reservist recommendation. In Winn's case, the recommendation came from Dick Pollak, Beaver Falls supervisor of production planning. Pollak is a sergeant first class in the 99th ARCOM Reserve unit, headquartered at Oakdale, Pennsylvania. Pollak explained his reasons: "My job in the Reserves is on the general's staff. As such, I can be called up to active duty on very short notice, and for periods of one or two days at a time. It is much less predictable than those employees who attend two weeks of summer camp. Bob was very supportive of my schedule, and understood the commitment."

Pollak's recommendation was approved locally, and forwarded to the Pentagon. At a recent ceremony, Winn was presented the award by U.S. Army Col. W. W. Winslow. Winn's reaction displayed the attitude that lead to his selection: "I have a personal as well as an employer feeling toward those who serve in the Armed Forces Reserve or National Guard. Their commitment not only strengthens our Country, but encouraging these efforts also strengthens them as individuals and, therefore, as employees."

U.S. SALUTES LTV STEEL MANAGER – – Bob Winn (center), Beaver Falls cold finished bar plant manager, receives a certificate of appreciation for his support of the Reserves and National Guard from U.S. Army Colonel W. W. Winslow (left). Dick Pollak, who recommended Winn, is also present.

WE'LL DO EVEN BETTER IN 1988! John Russ, superintendent, rolling and finishing department (left), and Eldred Davis, 54" temper mill roller, reflect the new Warren Works spirit of teamwork that produced quality tons at record rates.

Cooperative spirit results in record-breaking output

There's an old adage that says, "records are made to be broken." At Warren's rolling and finishing, and coated products departments, the maxim was proven true time after time in 1987. The spirit of cooperation there paved the way for record-breaking productivity and quality improvements.

Rolling and finishing broke 42 records in 23 categories. Coated products set 9 new marks on the galvanizing line and 12 on the terne line — for a total of 21.

Recently, representatives from each of the departments met to discuss the reasons for these outstanding performances. John Russ, superintendent of rolling and finishing, noted, "What the record sheet doesn't show is that every new record was set with the best quality performance ever — on both the hot and cold sides. That's a tribute to the camaraderie of our people and to IPC problem-solving."

Bill Beinecke, coated products superintendent, indicated that solving their own line problems and getting good steel from other departments allowed coated products to break four yield records last year. "This is a very concerned work force," Beinecke said. "They're concerned about their jobs and take pride in the product they produce."

Hot side supervisor of finishing, Grady Holt, indicated, "One of the basic concepts of IPC is that if you improve your quality, productivity will follow." Holt recounted how a serious problem with coil weld breaks was solved through an LMPT formed of people from various areas. "We reduced weld breaks from five to less than one percent," he said. Now the hot side is able to send bigger coils through for processing, a change that has significantly increased yield all the way down the line.

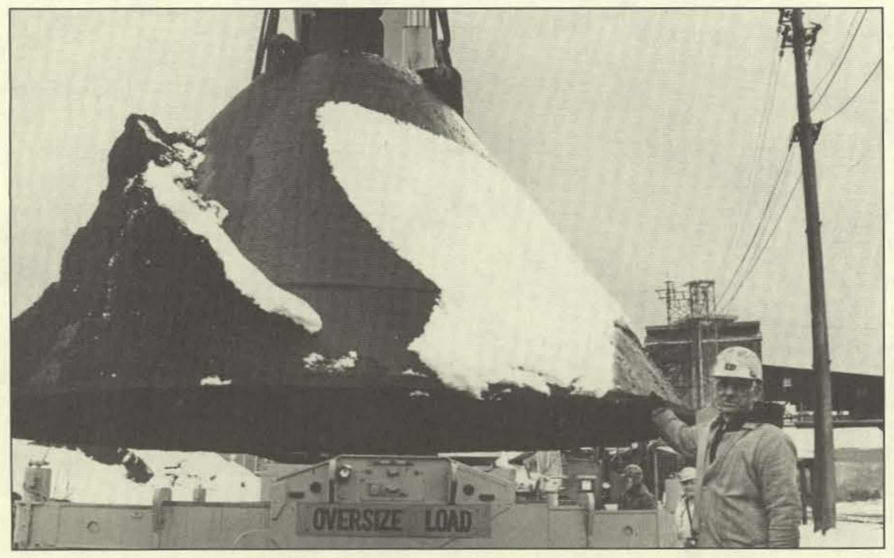
"People are more aware of the other guy's problems and more willing to work together," Holt continued. "If there's a problem on the galvanizing line, the tandem mill, or anywhere else, we react because they're our customers. And we get the same cooperation when we contact them."

Teamwork solved a tracking problem on the pickler last year, said John Rinda, hot side maintenance supervisor. "We pulled people together from production, maintenance, mechanical, electrical, and even a guy from the galvanizing department. Together, we all worked it out. When you have people from different areas sitting down together, you get a better feel for everything," he emphasized.

Eldred Davis, a roller on the 54" temper mill, who has worked at Warren for 35 years, contrasted this new spirit with the "old way of doing things." Davis explained, "Before, the attitude was adversarial. Everybody had a designated job and that was about all they'd do. But for the past two years, people have been more willing to help their co-workers, and that's one of the main reasons we do set production records and improve our quality."

As far as the goals for 1988, all agreed on continuous improvements in every area. "We're going to keep going forward," emphasized Davis. "Our biggest job is still quality. After all, quantity doesn't mean anything if you don't have quality."

John Russ added, "We have established a paradigm shift. With the spirit of working together, and the spirit of LMPT, our desire is to **excel**."



PITTSBURGH COKE PLANT rigger foreman Ed Feth directs the loading of a 10-ton blast furnace bell for delivery to the city's Industrial Heritage Walkway at Station Square.

Eliza to be immortalized

During the early '80s, LTV Steel razed the Eliza blast furnace at Pittsburgh Works. The only evidence of its remains were three spare parts.

For ten years, two bells and a hopper ring rested undisturbed at the Pittsburgh coke plant, since the material composition made them unsuitable for remnant scrap. Recently, these relics were moved to a new home and will become part of an historical, industrial exhibit.

"The three blast furnace pieces were donated to the Pittsburgh History and Landmarks Foundation," said Ken Kobus, instrumentation supervisor. "They will be a permanent display of the Industrial Heritage Walkway, located at Station Square along the south bank of the Monongahela River."

A procession of items will be arranged, so that a visitor will be able to understand how a steel mill operates, explained Kobus. Artifacts from other industries will also be exhibited on the industrial trail, which will take two years to complete.

Support Our Customers' Products!

Would you like a free cookbook containing tasty recipes made from food packaged in tin cans? If so, on your next trip to the supermarket, be sure to pick up some of our customers' products:

- Campbell Soups
- Carnation and Contadina Products
- Comstock Pie Fillings
- Franco-American
- Hunt's Tomato Products
- Kal-Kan Pet Foods
- Libby Products
- S&W Canned Fruits
- Stokely Products
- V-8 Juice
- VanCamp's Pork and Beans
- Vlasic Pickles

Just peel off the labels from *five different products* and complete the form below to receive your "Carefree Cuisine" cookbook. It contains 50 tantalizing recipes compiled by the Canned Food Information Council.

Order quickly, while supplies last (one cookbook per employee). Bon Apétit!

Send canned food labels to:

LTV Steel Cookbook Offer
Public Affairs, 902 L
LTV Steel Building
25 W. Prospect
Cleveland, Ohio 44115

Name: ______
Job Title: ______
Plant/Office Location: ______
Home Address: ______
City, State, Zip: ______

LTV STEEL NEWS FRONT

Basketball competition nets company superstars

THE LTV STEEL-COMMERCIAL department team won the "3-on-3" half-court basketball competition during a recent LTV Steel employees night with the Cleveland Cavaliers.

Presenting the victor's trophy to commercial team players Tom Rybak, Rick Szink and Bruce Harnish, was Peter Kelly (left), LTV Steel executive vice president.

Making the runners-up presentation to Cleveland Works #1 coke plant players Burnell Miller, Eric Blandon and Eric Tysinger, was Jim Anderson (right), Bar Division vice president, operations.

Winning team members were awarded special "3-on-3" jackets and CAVS tickets, while the runners-up each received autographed NBA basketballs and CAVS tickets. Nearly 800 employees, their families and friends watched the CAVS beat the Washington Bullets in overtime, 128-126, before a crowd of 18,700 fans.

BOF SHOP EMPLOYEE Henry Lee was one of the first employees from Indiana Harbor to record a radio spot. Lee discusses the many reasons for his long-time involvement with the Gary Boy Scouts.

Harbor employees star on local radio broadcasts

LTV Steel recently hit the airwaves of Northwest Indiana and South Chicago with 60-second radio spots recorded by employees. Airing on WLTH-Gary, WWJY-Crown Point and WJOB-Hammond, the current spots will continue throughout the year.

"This new communications effort will inform the communities of the many positive achievements of our employees," explained Michael LaWell, regional manager of government and public affairs. "During the coming months, employees, their families and friends, will hear messages from the people who **are** LTV Steel."

Some of the radio spots report on employee volunteer efforts with Junior Achievement, Boy Scouts and the Red Cross. Others include a report on the new ladle metallurgy facility under construction at Indiana Harbor and various capital projects planned for the Harbor in future months.

Individuals are selected for the radio spots based on their achievements or contributions either on the job or in the community.

Each spot is introduced and closed using the same theme: "LTV Steel is people building the future for themselves and their community. Building the future through their dedication to making the highest quality steel and their partnership in community progress."

On the radio spots, Donna McCarty, a Harbor tech services employee, discusses LTV Steel's Junior Achievement program and how it benefits community youth.

Explaining his involvement in the Red Cross life-saving program is Rich Baranowski, IHW transportation services. Don Giedemann, engineering manager of the IHW ladle metallurgy facility project, tells of the improved operations and increased throughput expected with the LMF start-up.

In addition to praising IHW employee efforts in his radio spot, Dick Veitch, Indiana Harbor Works general manager, discusses capital projects under way at the Harbor, reflecting the enormous investment LTV Steel has made in Northwest Indiana.

"It's important to get LTV Steel employees' individual and collective achievements known throughout their communities," emphasized Veitch. "We believe this radio program will be an excellent vehicle to get the good word out about our many dedicated and talented employees."

CAT is 'pick of litter' at Elyria Steel and Tubes

The recent purchase of two tractors at Elyria Steel and Tubes is a good example of how the participative process works.

Using this approach, both hourly and salaried employees had input in the decision to buy new mobile equipment for the tubing mill's welding and finishing departments.

Lynn Sayers, welding foreman, heads up Elyria's tractor repairs. He said, "Years ago, plant engineering bought our tractors, consulting a few suppliers and then selecting the one with the best price — that's changed now."

A meeting was held with employees who would be impacted by the decision, and included mobile equipment repairmen, steel handlers, tractor drivers, shippers, various supervisors and the plant engineer.

Sayers stated, "As a group, we reviewed a long list of requirements covering parts availability, equipment reliability, visibility conditions, special features and cost."

Towmotor operator Charles Martin wanted a vehicle that provided good frontal clearance. He said, "Some tractors have a single mast in front which blocks the driver's view."

Looking at the situation from a maintenance perspective, John Petruzzi, mobile repairman, favored Caterpillar tractors. He explained, "Of all the tractors in the plant, the CATs have been in service the longest and require the least maintenance. They're an all-around, heavy-duty piece of equipment."

Other pluses for this manufacturer were parts availability and next-day service.

Ed Plues, shipper and president of Local 3224, noted that one of the biggest benefits of the CAT was its ability to "pick up two lifts of tubing, instead of one."

Another consideration of the group was the use of pneumatic tires over air or solid tires. Pneumatic tires offered a better ride and withstood punctures, making them almost "flat-proof."

Employees finally decided on two Caterpillar tractors. One was a "bull-nose" model which picks up coils by spearing them through the center; the other a forklift.

There have been no complaints about the performance of the two vehicles. Everyone is satisfied, because they were a part of the decision.

CATERPILLAR

MOBILE REPAIRMAN John Petruzzi (left) and towmotor operator Charles Martin had input into the decision to purchase two new tractors for the Elyria Steel and Tubes plant.

Warren prepares for furnace reline

How do you schedule a reline in a single blast furnace plant so that overall steel operations don't come to a screeching halt? Very carefully, Warren employees are discovering, as they complete planning and engineering for the '88 reline of their solitary blast furnace.

Last relined in 1981, the furnace has consistently outperformed original expectations, said Jim Eakin, general superintendent of steelmaking. The 28-foot diameter vessel presently routinely produces 3,900 tons of hot metal per day — **500 tons** over its rated capacity. Unlike previous relines, this one is being planned, engineered and directed almost completely in-house. The advanced planning is expected to be less disruptive to overall steel operations and have longer-lasting benefits.

During the 65-day shutdown, set to begin July 31, the furnace lining will be completely replaced with new refractory materials, said Ray Zeuner, works engineer. Brian Mitchell, blast furnace superintendent, said this project is considered a "mini" reline. "The reline is only for the equipment you can't service during normal small repair turns," he explained. "Our goal has been to keep the exterior and auxiliary equipment well maintained to get the most we could out of the furnace."

The hearth, which was last replaced during a major rebuild in 1973, will be replaced when the furnace is opened for repairs. But Mitchell and Zeuner don't really anticipate an unpleasant surprise. "In my 24½ years in plant engineering, I've never seen blast furnace equipment in such good shape," said Zeuner. "This particular program will be less expensive, mainly because everything is in good condition."

An equally big challenge for Warren will be to order, schedule and arrange delivery of equipment, supplies and workers just in time for the reline. "First, we don't have enough warehouses to store all the material required for the reline and, two, it's foolish to bring it all here in March, pay for it and let it sit," said Mitchell. "Our plan is to bring everything in as we need it and handle it one time."

"We're putting together a detailed step-by-step schedule for the shutdown," Zeuner said. All engineering and development will be completed by April 1, at which time the construction contractor will be preparing the site for the actual shutdown. Furnace refractories, which have been on order since early to mid-February, will begin arriving July 1. The copper coolers, hot blast valves, piping and other materials will arrive just as they are needed during shutdown. The planning has gone very well and the results should be apparent.

COUNTDOWN TO WARREN RELINE – – Reviewing the plans for the Warren blast furnace reline are: Ray Zeuner, works engineer (left); Brian Mitchell, blast furnace superintendent; and Jim Eakin, general superintendent-steelmaking.

Construction on target at Indiana Harbor ladle met

Construction continues on Indiana Harbor's $76 million ladle metallurgy facility and vacuum degassing unit. The high-tech LMF is expected to begin operation during the fourth quarter of this year.

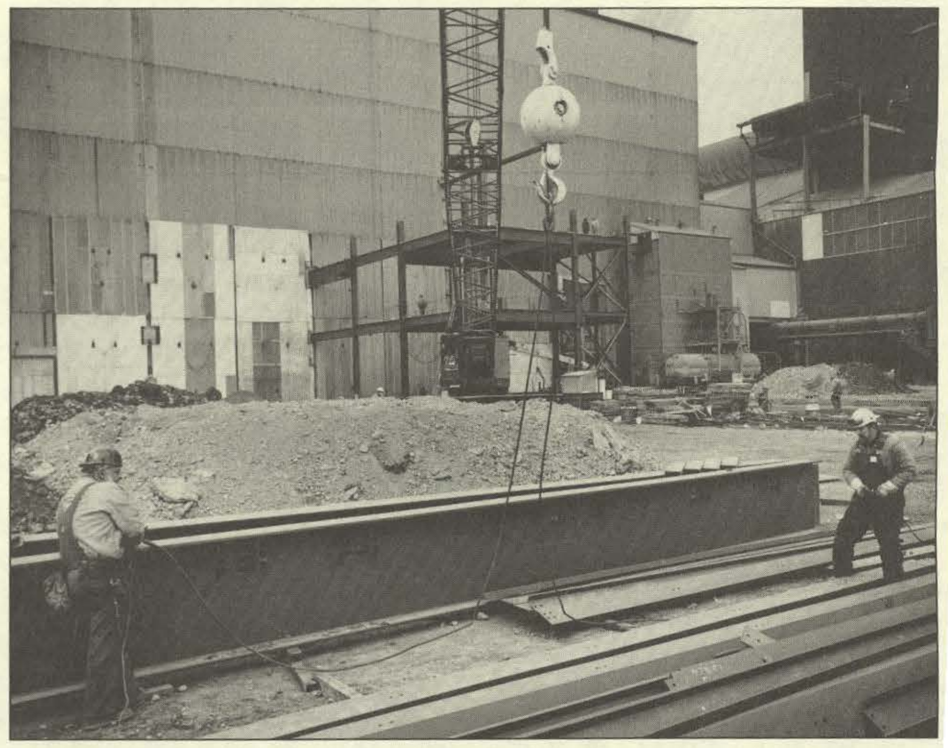
"Upon completion, this LMF will be one of the largest capacity units built in the United States," said Tom Wrenn, IHW manager of primary operations.

The LMF will have the capability of producing ultra-low carbon steels, which are superior in formability, cleanliness and consistency.

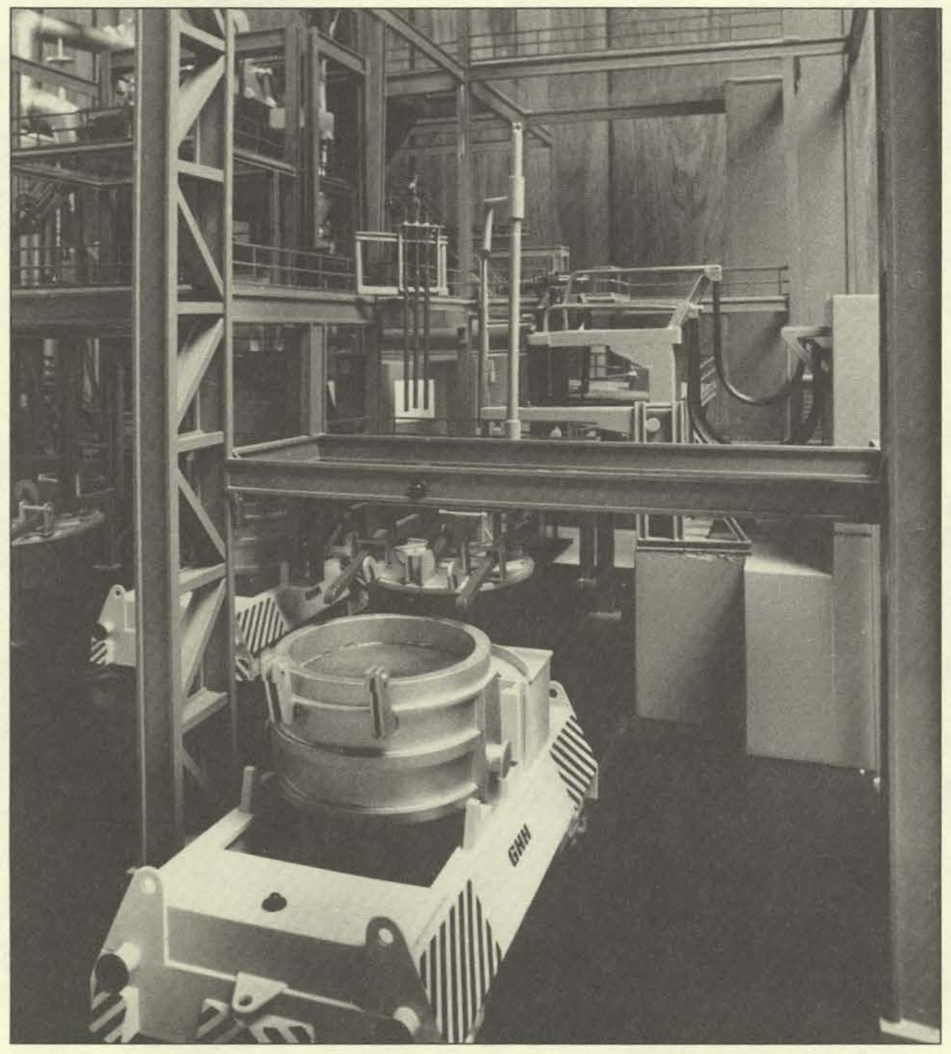
"These ultra-low carbon steels also enable us to compete head-to-head with other materials such as plastics," Wrenn noted.

The LMF will also substantially improve operations between the BOF vessels and the continuous casters — enabling both to operate at a higher capacity.

"The facility will require new 285-ton steel ladles in order to accommodate induction stirring," said Neil Donaghy, IHW steel producing superintendent. "Our continuous caster output is also expected to increase some 350,000 tons per year."



FIELD CONSTRUCTION ON THE $76 million LMF started in April 1987, and structural steel erection began in October 1987. The project is expected to be completed during the third quarter of 1988.



A SCALE MODEL OF THE INDIANA HARBOR Works ladle metallurgy facility details the future operations.

Cleveland completes upgrading

Capital and maintenance improvements totaling several million dollars were recently completed at the Cleveland Works electric furnace shop and direct roll complex. The two-week outage involved major overhauls to #79 and #80 electric furnaces, #2 slabbing mill (USM) and the 80″ hot strip mill.

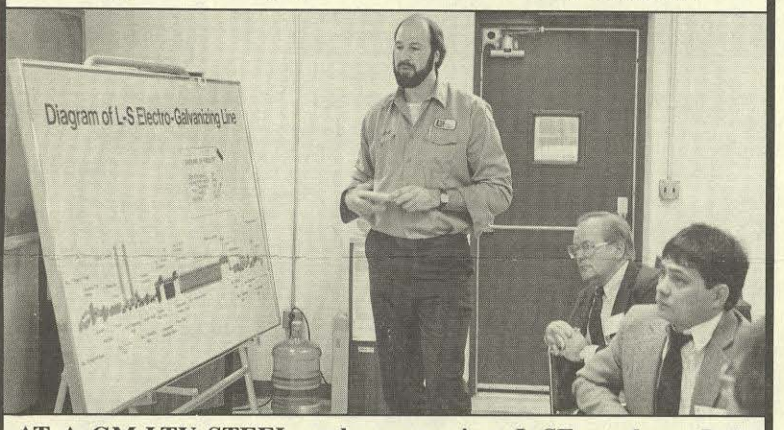
Jack Bush, general manager, said, "Improvements to those operations were both quality and reliability-driven, designed to satisfy our customers' ever-increasing needs for higher quality products with on-time delivery."

Two key, long-term benefits from the repair projects will be increased reliability of those facilities and improved yields. At its peak, 250-300 people were working on various phases of the enormous undertaking.

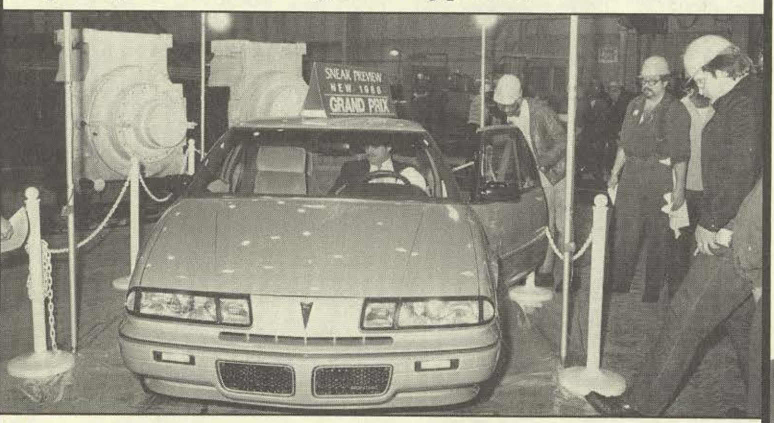
REPLACEMENT OF THE BRICK i the bottom of #79 and #80 furnaces, e tensive crane overhauls and enviro mental control work to the precipitat stack, were among the major projec completed at Cleveland's electric furna shop, said Joe Cianciola, area supervis maintenance.

THE CUSTOMER IS the focus of everything we do at LTV Steel, and the above sign confirms that message.

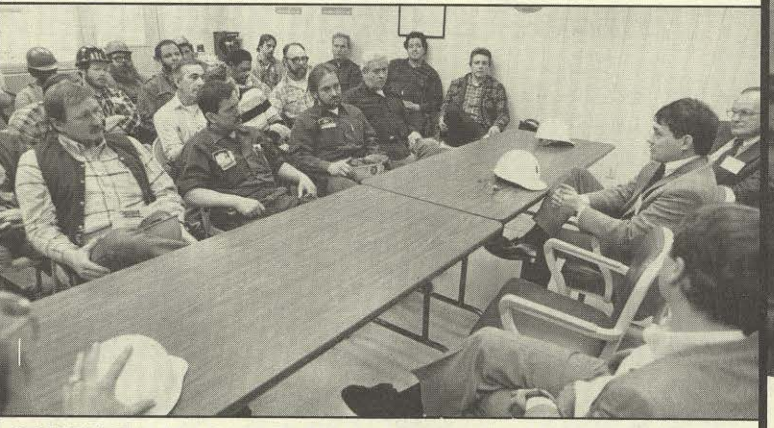
A HANDSHAKE SYMBOLIZES the partnership between GM's Marty Arnold, Fairfax plant metallurgist (left), and Don Vernon, V.P. and general manager, L-S Electro-Galvanizing Company.



AT A GM-LTV STEEL exchange session, L-SE employee Rob Popek explained the electrogalvanizing process.



THE SPOTLIGHT was on General Motors' new Pontiac Grand Prix at #3 finishing, Cleveland Works, where scores of employees stopped by for a look-see.



PONTIAC REPRESENTATIVES talked with Cleveland #3 finishing employees about the shared responsibility LTV Steel has with GM, as a key steel supplier for the Grand Prix.

WORLD-CLASS PARTNERSHIP

"We Build Excitement...Pontiac!" That's the message General Motors is sending to us with its all-new 1988 Pontiac Grand Prix.

Hundreds of LTV Steel employees had that feeling of "building excitement" as they got a sneak preview of *Motor Trend* magazine's 1988 "Car of the Year." Awarded America's highest automotive honor, the Grand Prix received rave reviews during its recent tour of Cleveland and Indiana Harbor Works and the L-S Electro-Galvanizing (L-SE) line.

Employees at those locations had a chance to kick tires and lift the hood of this totally new model. The Pontiac Grand Prix is part of the GM-10 car series (Buick Regal and Oldsmobile Cutlass also belong to this group), and carries a base price tag of about $12,500 — ranging to $16,000 fully loaded. Its high-tech cockpit interior and form-fitting, articulating front-bucket seats with wrap-around arms are an ergonomic (biotechnological) pleasure.

The purpose of the visit was to enhance the partnership between General Motors and LTV Steel. LTV supplies automotive steel for the Grand Prix, which is stamped and assembled at GM's new Fairfax plant, located in Kansas City, Kansas. GM has invested over a billion dollars exclusively to manufacture the Grand Prix, which was officially unveiled to the public this month. LTV supplies cold rolled, hot-dip galvanized and electrogalvanized products for the roof, hood and inner and outer deck.

LTV Steel's Karl Hey, assistant district sales manager-Kansas City, traveled with GM representatives Marty Arnold, GM Fairfax plant metallurgist, and Mike Varvel, Fairfax stamping plant production supervisor, on their visits to LTV facilities.

According to Hey, the trip gave the GM reps exposure to many LTV employees, especially at the plants where steel for Fairfax is produced.

"Both Marty and Mike were impressed with the enthusiasm of our people," Hey stated, "and how serious they are about doing their jobs right."

Mike Varvel explained the reason for the GM visit to LTV Steel. He said, "We're pleased to have the opportunity for our two companies to become better acquainted. GM is proud of this automobile and hopes that LTV feels the same way as a key supplier. The Grand Prix is really **our** car — both General Motors' and LTV Steel's," Varvel emphasized.

Pontiac's Marty Arnold shared his perspective of the GM-LTV Steel partnership, indicating that the Fairfax plant produces over 1,000 cars a day. "Obviously, we need good, consistent quality steel for our operations, or we'll lose production," Arnold said. "Working together, I believe both companies will be successful in making world-class quality products, and that's what the GM-LTV Steel partnership is all about."

After showcasing the vehicle at various finishing departments, group discussions were held between GM representatives and LTV Steel mill operators. A positive exchange took place covering such topics as Integrated Process Control (IPC), just-in-time delivery, the team management concept and overall quality performance.

Arnold and Varvel were pleased with the use of IPC in the plants and the employees' knowledge of statistical process control. GM uses SPC at its operations, as well as the team management approach to making improvements in the workplace.

During an employee meeting at the L-SE line, Bob Buck, senior vice president-commercial; and Frank Altimore, vice president-quality control; joined L-SE's Don Vernon, vice president and general manager; and Kazu Watanabe, vice president and assistant general manager; and other electrogalvanizing personnel for a presentation and discussion.

Rob Popek, L-SE process technician, provided an excellent overview of the zinc-coating process and explained how the line operates. With his extensive job training and skills, Popek can operate any position on the line and do most of the required maintenance work. He was impressed by the professional, business-like manner of the GM representatives.

Rufus Arnold, warehouseman at Cleveland's #3 finishing mill, liked the new approach of the "little people" (workers) dealing directly with customers. "We're in at ground level," he said, "and that's beneficial for both companies because we can better satisfy each other's needs."

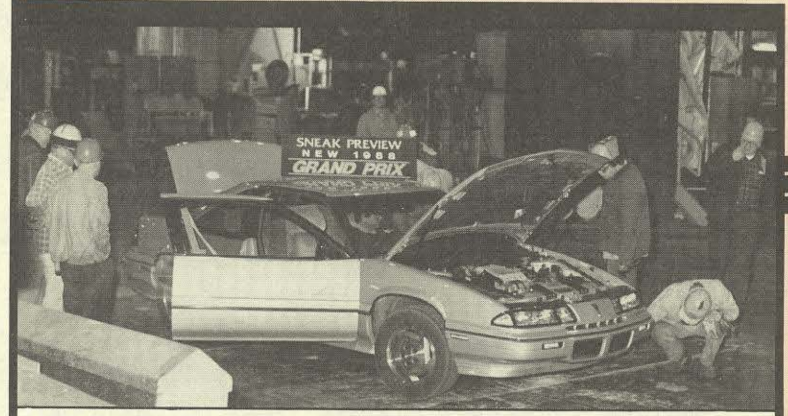
The Cleveland Works employee enjoyed meeting the GM personnel, as he asked questions and received immediate feedback. He hopes LTV Steel continues "to do a good job supplying GM with quality steel."

The General Motors representatives brought up two key points at the exchange sessions. First, they would like steel suppliers to provide coil weight information on incoming shipments. Secondly, they require coils with fewer welded seams, preferably two welds maximum per coil.

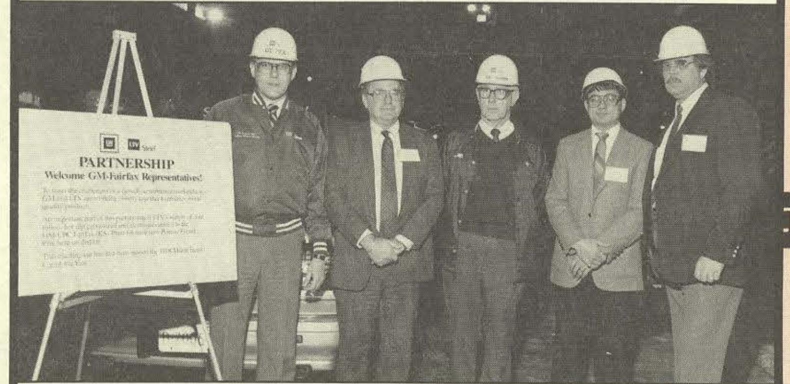
Indiana Harbor Works marked the last leg of the tour. Harbor general manager Dick Veitch thanked the GM representatives for meeting with LTV Steel employees to help build a more rewarding customer-supplier partnership.

"We're grateful to our good friends at General Motors, who were gracious enough to display the new Grand Prix here and at other LTV locations," Veitch stated. "We feel it is very important for our employees to become involved with customers and their products as much as possible."

INSPECTING THE SPORTY GRAND PRIX at morning shift change was a pleasant way to start the workday at #2 finishing, Cleveland Works.



NUMEROUS EMPLOYEES from Indiana Harbor's #2 sheet mill came out to inspect the attractive new Pontiac Grand Prix, which was displayed between the two galvanizing lines.



DISCUSSING THE PARTNERSHIP at #2 sheet mill (from left) are: Don Ziol, IHW manager of flat rolled operations; Karl Hey, Kansas City assistant district sales manager; Ed Traher, #2 sheet mill superintendent; Mike Varvel, GM Fairfax stamping plant production supervisor; and Marty Arnold, Fairfax plant metallurgist.

INDIANA HARBOR 84" hot strip mill employees checked under the hood and closely examined the new Grand Prix. Among the most frequently asked questions: "How much does it cost?"

DURING GROUP discussions at the L-SE line, GM personnel met with various LTV Steel vice presidents, supervisors, union leaders and production employees.

LTV is one of two steelmakers supplying cold rolled, hot-dip galvanized and electrogalvanized steel for GM's 1988 Grand Prix.